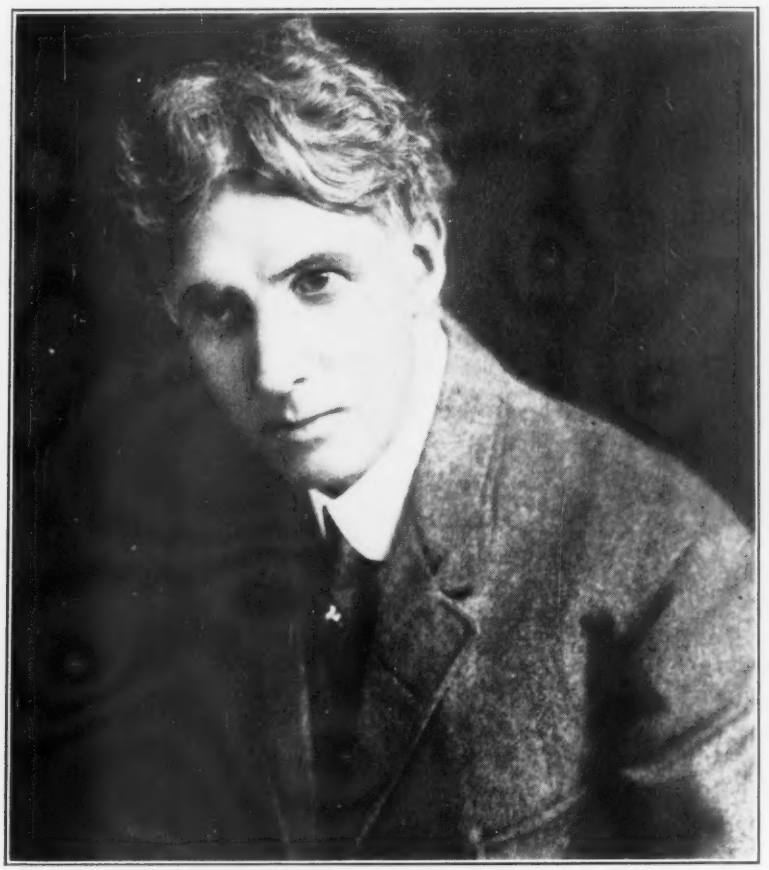
THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

Volume 16 JUNE, 1937 Number 6



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(See page 268 for story of life of Dr. Duncan)

1891 **Trade News** 1891

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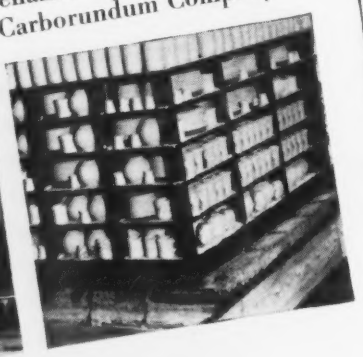

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Publication Office: 20th & Northampton Sts., Easton, Pa.
Editorial and Advertising Office: 2525 N. High St., Columbus, Ohio.
Executive Office: 2525 N. High St., Columbus, Ohio.
Committee on Publications: J. D. SULLIVAN, *Chairman;* R. F. SHERWOOD, E. DE F. CURTIS, W. W. WINSHIP, ROSS C. PURDY.

Entered as second-class matter at the post office at Easton, Pa., under the act of March 3, 1879. Published monthly.
Subscription $1.50 a year. Single numbers twenty-five cents
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Chicago Vitreous Enamel Product Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
The Hommel Co., O., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.
Bethlehem Steel Co.

Enameling Muffles
Bethlehem Steel Co.
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)
Pittsburgh Plate Glass Co.

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Pittsburgh Plate Glass Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.

Enamels (Porcelain)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Equipment (Porcelain Enameling)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The DeVilbiss Co.
The Hommel Co., O., Inc.

Exhaust Systems
The DeVilbiss Co.

Feldspar
Ceramic Color & Chemical Mfg. Co.
Consolidated Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
Sant, Richard C.
The Vitro Mfg. Co.

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Spinks Clay Co., H. C.

Flint
Ceramic Color & Chemical Mfg. Co.
Consolidated Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.

Flint Pebbles
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

French Flint
Consolidated Feldspar Corp.
Paper Makers Importing Co.

Frit
Allied Engineering Co.
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
The Hommel Co., O., Inc.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Fuel Oil Systems and Control, Stokers
Bethlehem Steel Co.
Frazier-Simplex, Inc.

Furnaces
Allied Engineering Co.
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Denver Fire Clay Co.
Frazier-Simplex, Inc.
The Hommel Co., O., Inc.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment
Hartford-Empire Co.
Lancaster Iron Works, Inc.

Glass Melting Pots (Open and Covered)
Pittsburgh Plate Glass Co.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.
Pittsburgh Plate Glass Co.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Consolidated Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Paper Makers Importing Co.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld & Co., B. F.
Du Pont de Nemours, E. I., & Co., Inc., R. H. Chemicals Dept.
The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Consolidated Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Paper Makers Importing Co.

Goggles
Willson Products, Inc.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Du Pont de Nemours, E. I., & Co., Inc., R. H. & Chemicals Dept.
The Hommel Co., O., Inc.
The Vitro Mfg. Dept.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Co.

Granulators
Lancaster Iron Works, Inc.

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Chicago Vitreous Enamel Product Co.
Norton Co. (*Alundum-Crystolon*)

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Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co. (*Crystolon*)

Hearths (Fused Al_2O_3, SiC)
Electro Refractories & Alloys Corp.

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

Hose (Air and Fluid)
The DeVilbiss Co.

Iron (Enameling)
American Rolling Mill Co.
Bethlehem Steel Co.

Iron Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
The Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
Ceramic Color & Chemical Mfg. Co.
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Edgar Brothers Co.
Edgar Plastic Kaolin Co.
Hammill & Gillespie, Inc.
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Paper Makers Importing Co.
Sant, Richard C.
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The Vitro Mfg. Co.

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Electro Refractories & Alloys Corp.

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The Hommel Co., O., Inc.

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The Hommel Co., O., Inc.
Paper Makers Importing Co.

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Corhart Refractories Co.
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The Hommel Co., O., Inc.

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Tile (Muffle)
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Electro Refractories & Alloys Corp.
Norton Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
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Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
Pittsburgh Plate Glass Co.

Tile (Wall)
Denver Fire Clay Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
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Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Hommel Co., O., Inc.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel Co., O., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Trucks
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Tubes (Insulating)
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McDanel Refractory Porcelain Co.
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The Vitro Mfg. Co.

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The Hommel Co., O., Inc.
The Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
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The Hommel Co., O., Inc.
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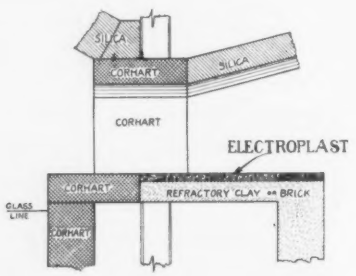

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VOLUME 16 JUNE, 1937 NUMBER 6

PAPERS

RAW MATERIAL REQUIREMENTS IN THE WHITEWARE AND GLASS INDUSTRIES*

By E. H. Fritz

Abstract

A study has been made of the refinement of clays and the value of uniform particle size and its effect on density and shrinkage. Nonplastics should be moistened to reduce the dust hazard. New fluxing materials are discussed, particularly materials that prolong the range of vitrification. Materials to replace flint would be advantageous and the use of talc and other silicate minerals is suggested as a means to lower the manufacturing costs.

I. Introduction

In outlining raw material requirements in the whiteware and glass industries, the subject naturally divides itself into a discussion of the raw materials now commonly in use in those industries, followed by a summary of possibilities that are now apparent in the way of new materials to produce better or cheaper products. Inasmuch as the writer's experience has been limited entirely to the electrical porcelain field, a number of representative men have been contacted in those industries to give as broad a viewpoint as possible.

As to the materials now in use, greater uniformity is still felt to be necessary in spite of what has been accomplished by the raw materials producers. This feeling is indicated by the increasing use of specifications for materials by the consumers. This trend, which has been in progress for many years, undoubtedly has had much to do with the development of chemical control of feldspar and flint and other nonplastic minerals, which is now firmly established and has resulted in marked improvement in the uniformity of these materials. There still is found too much variation, however, in the chemical composition of the nonplastics. This refers particularly to the undesirable constituents, such as iron and titanium oxides, because of their effect on color and to some of the other constituents of feldspar specifically which affect fluxing and deflocculating properties.

The need for greater uniformity is even more pressing with clays. Specifications have been developed for clays by some consumers, but until a more satisfactory method is found for measuring plasticity, the workability which clays impart to the bodies in which they are used and the factors responsible for the casting properties of the clays, such specifications will not be adequate nor will the whiteware industry be free of variations in these properties. These are such vital factors in the success of many of the operations that the importance of uniformity in these properties can hardly be overestimated. More careful selection of clays and improved methods of storing have been of assistance but they do not solve the problem.

Uniformity naturally suggests another need, *i.e.*, greater refinement or higher degree of purity. In mentioning undesirable constituents, such as iron and titanium oxides, it is but natural that the complete elimination of these items is ultimately

* Presented at a joint meeting of the Materials and Equipment Division, American Ceramic Society, and the Industrial Minerals Division, A.I.M.M.E., State College, Pa., September 25–26, 1936.

Received November 18, 1936.

hoped for. This is of equal importance both to the glass and whiteware industries. Magnetic separators for finely ground materials are seemingly not as efficient as they should be.

II. Refinement of Clays

The refinement of clays is a subject that still offers wide possibilities. Some work has been done on certain types of china clay by the Tennessee Valley Authority[1] which definitely indicates that, by treatment, such clay can be improved in strength and plasticity to approach that of ball clay. This would permit the reduction or elimination of ball clay in bodies which not only would improve color but would vastly simplify the firing problem. A substantially shorter firing cycle would be possible with resulting economy. The success of this work as far as it has gone suggests possibilities in the treatment of ball clay as well as other types of china clay. Shredding of ball clay is now quite common, and from this point something should be done looking to the elimination of lignite and to the improvement of the firing behavior of these clays. It is quite conceivable that the processing of clays will result not only in improved products lower in cost, but may also solve the problem of uniformity and its control. It should also determine more definitely the difference in the properties of hard and soft Georgia kaolins, which is important in some of the whiteware industries.

III. Uniformity in Particle Size

The study of particle size should receive further attention. Present-day grinding of the nonplastics has shown an improvement over that of a few years ago. There is still too much variation, however, between shipments, which disturbs such things as casting properties, workability, and the maturing temperatures of the body compositions. To a large extent, this variation exists in the subsieve particle sizes, which indicates the need of a more satisfactory method of measuring these particle sizes. The standard mesh screens, however, also show considerable variation and this offers a definite field for improvement to the grinders. Present specifications will likely be gradually made closer, giving limits in both directions.

More thought is being given to the effect of particle size on density and shrinkage. The refractories industry has found that proper proportioning of particle size results in greater density and lower shrinkage. This would be of tremendous value to the whiteware industry where the present high shrinkage is responsible for many problems. It is realized that this is an activity that must be followed by the industries, but it may result in closer specifications of particle size for all raw materials, limiting in both directions the finer as well as the coarser particles. It may also lead to a specification of particle shape, that is, whether rounded or flake shape, since it is felt by some that this is important to obtain the best density and structure. This would materially complicate the grinding problem and the grinders might well begin to give this subject some attention.

IV. Fine Material Moistened to Reduce Dust

In connection with grinding, the dust problem is rapidly increasing in importance owing to the attention and publicity that has been given to silicosis in recent years and the consequent necessity of all employers to protect their employees to the extent that is within their power. The use of a small amount of water by the grinders, uniformly distributed, has resulted in decided improvement and takes care of the situation if not too much time elapses between the grinding and the use of the material. This suggests the desirability of a more permanent medium than water to eliminate the dust. I have nothing to suggest at the moment, but something probably can be found. Other industries are giving this subject their attention. The coal industry began with the use of a solution of calcium chloride, but because the railroad cars were affected by this material, they are now using oil. In both cases, dust elimination is taken care of sufficiently long enough to be permanent. Because of the nature of the glass and whiteware products, the field of possibilities along this line is, of course, limited and whatever material is used, including water, the amount will have to be carefully controlled.

V. New Fluxing Materials

Turning to new materials, low-temperature fluxes are an active subject because of their definite possibilities in cost reduction. There have been important developments in recent years both along the line of synthetic fluxes and natural materials. The most recent of these is the use of

[1] For a Progress Report on this work, see *Jour. Amer. Ceram. Soc.*, **20** [6] 175–214 (1937).

nepheline syenite as a substitute for feldspar. While the work so far shows promise, it has not offered anything entirely satisfactory, but this should only tend to increase our efforts along this line. Firing remains one of the large elements in cost and any reduction in the firing temperature will result in substantial cost reduction.

While on the subject of fluxes, a more visionary idea is the development of a glass which expands in firing. This would offset shrinkage from the clays and possibly result in a low total shrinkage, the benefit of which is obvious. Some fluxes have been reported to have this property but there are many obstacles to be overcome, such as firing range, porosity, and color. Nevertheless, with new materials constantly being found, something along this line may be developed. An example of a new unique material is Plastic Vitrox derived from volcanic rock, which has the fluxing power of a siliceous feldspar and also possesses a certain amount of plasticity.

VI. Substitute for Flint in Porcelain

Another recent development is the new understanding of the rôle of flint in a whiteware body. Instead of the flint going into solution to a considerable extent, it has been found that there is practically no reaction with the other constituents and it is, therefore, an inert filler. Since flint with its troublesome inversions places definite limitations on the rate of firing in order to be free of dunting and to obtain a satisfactory product, this suggests the finding of a new inert material with a uniform coefficient as low as possible. Such a material should make possible a considerably shorter firing cycle which will reduce costs. Pyrophyllite has been suggested, but it is not entirely satisfactory as a complete substitute. It should be possible to develop or to find other materials answering these requirements since in this case they do not seem difficult.

VII. Talc in Whiteware Bodies

The desirability of an inert material with a low expansion suggests the development of low expansion bodies. Again this should result in a lower firing cost and materially improve various properties of the finished products, particularly those involving thermal shock. Talc is a material that figures actively in this development, and further knowledge is necessary of the various talcs that are available to develop suitable body compositions of this kind. Pyrophyllite also has possibilities in this field particularly in view of the success of this material, together with talc in some cases, in the development of tile bodies with low moisture expansion which practically eliminates crazing. This is an outstanding example of what can be accomplished with new materials, and low expansion bodies can probably be developed in a similar manner.

VIII. Magnesia and Alumina Minerals

The spark-plug industry is giving increasing attention to the use of basic minerals for spark-plug porcelain. This is necessitated by the constant improvement of the automobile engine and the increasingly severe conditions which the spark plug has to meet. Magnesia, magnesite, and alumina are materials that are being considered, but the purity of the available minerals of this kind is a considerable problem. Spark-plug porcelain requires a high degree of purity and, to obtain the benefits of these minerals at a reasonable cost, a more practical method of refining them will have to be developed. The history of this product has been one of constant improvement with gradually lowering cost, and the present activity is another step in this direction requiring, from the raw-material standpoint, improved materials with no increase in cost.

IX. Lower Cost and Higher Quality

The general demand from the entire whiteware and glass industries is for cheaper raw materials. This is apparent from the information which has been presented, since cost reduction is stressed more than anything else; this is to be expected in view of present-day thinking in the field of economics. It is now quite generally agreed that the only answer to a more permanent prosperity and a higher plane of living is lower prices for all materials so that they become available to a larger number of people, which will result in increased consumption. In this, all of us who have anything to do with the production of goods have a responsibility. It should be our aim to produce the product in which we are interested at a constantly lowering cost with no sacrifice in quality.

Porcelain Division
Westinghouse Electric & Mfg. Company
Derry, Pennsylvania

RAPID MODIFIED METHOD OF ANALYSIS OF SODA-LIME GLASS*

By Michel B. Vilensky

Abstract

Two samples of glass are used for the analysis: one for the determination of SiO_2 by a standard method and the other for determinations of other components. The second sample is first treated with HF and oxalic acid and finally with H_2O and oxalic acid. It is evaporated to dryness, cooled, and 75 milliliters of H_2O are added to each 0.01 gram of MgO content expected. The H_2O content must be a minimum of 100 milliliters. The solution is boiled for about 10 minutes and 3 milliliters of acetic acid (99%) are added for each 100 milliliters of the solution. The solution is transferred to a water bath for 4 hours to permit the CaC_2O_4 to settle. It is filtered and washed with cold 3% acetic acid solution and cold water. The solution is evaporated to about 100 to 125 milliliters and, if any precipitate is formed during the evaporation, it is filtered out, combined with the first one, and ignited in a tared platinum crucible; it is then treated with a few drops of 50% H_2SO_4, evaporated to dryness, ignited, and weighed as $CaSO_4$. The R_2O_3 group is determined in the usual manner. If any barium is present in the glass, it may be determined as sulfate, either in the filtrate from the R_2O_3 group or from the filtrate after separation of SiO_2 in the first sample. The filtrate, after the determination of $BaSO_4$ or the R_2O_3 group, is treated with 2 to 3 milliliters of H_2SO_4, concentrated below 100 milliliters, transferred into a graduated flask of 100-milliliter capacity, and reserved for the determinations of Na and Mg, which are determined on aliquot parts of the solution as sulfates.

I. Introduction

It is known from laboratory practice that the complete chemical analysis of soda-lime glass requires considerable time (about 5 to 6 days). Generally, the greater part of the time is consumed in the determination of alkalis and magnesia. It is often desirable to have a quick analysis of glass, which in many cases would indicate how manufacturing difficulties may be avoided.

By employing the standard methods, it is impossible to accomplish such work in a short time. For saving time and to obtain satisfactory results, the author recommends the following method of analysis.

II. Procedure

A one-gram sample of powdered glass, previously dried at 105°, is weighed into a platinum crucible of 30 milliliters capacity for the determination of SiO_2 by the standard method.[1]

A separate one-gram sample of the glass is weighed into a small platinum dish of 75 to 100 milliliters capacity.

This second sample is moistened with the minimum quantity of water and mixed with approximately 2 grams of powdered oxalic acid with the addition of 20 milliliters of 48% HF,[2] stirred with a platinum rod, and evaporated to dryness on the hot plate or sand bath, stirring the contents of the dish frequently. When evaporation is complete, the dish is heated gently over an open flame, the dish being rotated until white fumes of oxalic acid cease, to avoid excessive overheating.

After cooling the dish and moistening its contents with a few milliliters of cold water, approximately 2 grams of powdered oxalic acid are added; the contents of the dish are again evaporated to dryness and heated over an open flame as described above. This procedure is repeated once more.

When the oxalic acid is completely removed, the contents of the dish are moistened with hot water, stirred well, and transferred by means of a stream of hot water into a beaker with the addition of 75 milliliters of hot water for each 0.01 gram of MgO expected in the sample and 50 milliliters excess. The solution is now boiled for about 10 minutes with occasional stirring, after which 3 milliliters of 99% acetic acid are added for each 100 milliliters of the solution. The beaker is covered with a watch glass and transferred to a boiling-water bath for four hours, maintaining the amount of the liquid in the

* Received January 26, 1937.

[1] W. F. Hillebrand, "Analysis of Silicate and Carbonate Rocks," *U. S. Geol. Surv. Bull.*, No. 700, 285 pp. (1919).

[2] E. C. Sullivan and W. C. Taylor, "Some Rapid Methods for Glass Analysis," *Ind. Eng. Chem.*, **6** [11] 897–99 (1914).

beaker constant by addition of hot water as necessary.

After removal from the water bath, the solution is filtered (using S & S N 589 Blue Band filter paper), washed with a cold 3% solution of acetic acid, and finally 5 to 6 times with cold water. The filtrate now is concentrated by evaporation on a hot plate to a volume of about 125 to 150 milliliters and if, during this operation, any precipitate is formed, it is filtered off, washed in the same manner, combined with the first one, burned, and ignited in a tared platinum crucible.

The ignited contents of the crucible are moistened with 2 to 3 drops of water and 5 to 6 drops of 50% H_2SO_4 to decompose the last trace of CaF_2 which may form, evaporated to dryness, heated gently at first, and finally ignited to a constant weight and weighed as $CaSO_4$. To obtain the amount of CaO in the sample, the weight of $CaSO_4$ is multiplied by 0.4119.

The filtrate is transferred into a platinum dish, evaporated to dryness, and cooled. The residue is moistened with 3 to 4 milliliters of H_2SO_4, the sides of the dish are washed down with a minimum quantity of water, and the contents are evaporated as far as possible on a boiling-water bath. The dish is transferred to a hot plate equipped with an asbestos pad, covered with a watch glass, and evaporated to the appearance of heavy white fumes of H_2SO_4. It is removed from the hot plate, cooled, and the watch glass is washed into the dish with a minimum quantity of hot water. The contents of the dish are evaporated until barely damp, transferred into a beaker with a stream of hot water, and diluted to 100 milliliters. The solution is boiled for a few minutes to dissolve all salts, filtered through 9 centimeters of S & S N 589 Blue Band (or equivalent) filter paper, washed thoroughly with hot water, and evaporated down to a volume of about 100 to 150 milliliters. After addition of 3 to 4 milliliters of HCl and about 1 to $1^1/_2$ grams of NH_4Cl, the solution is brought to boiling and the R_2O_3 group is precipitated by the addition of a 50% solution of NH_4OH dropwise, using methyl red as indicator.[3] It is boiled for 1 to 2 minutes and, after standing 2 to 3 minutes, is filtered through S & S N 589 White Band (or equivalent) filter paper, washed with a hot 2% solution of NH_4Cl until free of sulfates; usually 5 to 6 times are sufficient. The residue is burned, ignited to constant weight in the usual manner, and reported as R_2O_3, from which Fe_2O_3 may be determined, colorimetrically, if desired.

If any barium is present in the glass, it may be determined as sulfate in the filtrate from the R_2O_3 group or from the filtrate after separating the silica in the first sample.

To the filtrate from the barium determination or the determination of the R_2O_3 group in case barium is absent, 2 to 3 milliliters of H_2SO_4 are added and the solution is concentrated slightly below 100 milliliters, transferred into a 100-milliliter graduated Pyrex brand flask, diluted to the mark, mixed thoroughly, and reserved for the determinations of alkalis and magnesium.

The alkali content in the sample is determined by the following procedure:

An aliquot part (about 25 milliliters) of the liquid is carefully transferred from the flask into the tared platinum dish and evaporated to dryness. The dish is heated gently over an open flame and is rotated until ammonium salts are expelled and its contents just melted. The heating is repeated several times until the constant weight of combined $MgSO_4$ and the Na_2SO_4 is obtained.

For the determination of magnesium, another aliquot part of the solution (about 50 milliliters) is carefully transferred from the flask into the beaker; this component is determined by the ordinary phosphate method, the corresponding weight of $MgSO_4$ is deducted from the weight of combined sulfates, and the Na_2O content is calculated from the remaining weight of Na_2SO_4.

These components may be determined also by the 8-hydroxyquinoline method if desired.[4]

If the glass contains K_2O, it may be precipitated as K_2PtCl_6 on an aliquot part of the solution reserved for the determination of $MgSO_4$ and

TABLE I

SAMPLES OF GLASS ANALYZED BY STANDARD METHOD RECOMMENDED BY NATIONAL BUREAU OF STANDARDS

	No. 1 (%)	No. 2 (%)	No. 3 (%)
Al_2O_3	0.63	1.00	2.05
CaO	9.83	10.49	9.69
MgO	Trace	Trace	Trace
Fe_2O_3	0.06	0.10	0.10
BaO	0.36	0.40	0.36
Na_2O	15.31	15.90	15.70

[3] Reprecipitation is not necessary if the aluminum oxide content is not expected to exceed 3%.

[4] J. Robitschek, "Use of 8-Hydroxyquinoline for Chemical Analysis of Silicates," *Jour. Amer. Ceram. Soc.*, **11** [7] 587–94 (1928).

Na_2SO_4. In this case, the reserved solution must be diluted to 250 milliliters.

The method outlined above has been employed by the author for analyses of soda-lime glasses and satisfactory results are obtained, some of which are presented in Tables I and II.

TABLE II

SAME GLASS ANALYZED BY MODIFIED OXALATE METHOD

	No. 1 (%)	No. 2 (%)	No. 3 (%)
Al_2O_3	0.66	1.00	2.07
CaO	9.85	10.53	9.68
MgO	Trace	Trace	Trace
Fe_2O_3	0.06	0.10	0.092
BaO	0.36	0.42	0.36
Na_2O	15.30	15.96	15.75

III. Summary

The method outlined above has the following advantages:

(1) Determination of SiO_2 content may be made considerably faster by reducing the sample to 0.5 gram.

(2) Determination of the CaO does not require double precipitation which is essential in the case of employing the standard method.

(3) Determination of Fe_2O_3 content does not require the use of a separate sample; it may be determined colorimetrically by fusing the residue with $KHSO_4$ after determination of the R_2O_3 group.

(4) The method permits the precipitation of magnesium and sodium contents with the solution of 8-hydroxyquinoline which saves time and insures accuracy.

(5) The complete analysis of glass for a routine laboratory control requires about two to three days.

LABORATORY OF OWENS-ILLINOIS PACIFIC COAST COMPANY
SAN FRANCISCO, CALIFORNIA

BIBLIOGRAPHY ON DECOLORIZING OF GLASS*

BY MORRIS SCHRERO† AND F. C. FLINT‡

This Bibliography was compiled primarily for use in connection with the paper presented by Mr. Flint before the International Congress on Glass.[1] It is confined to material in the Technology Department of the Carnegie Library of Pittsburgh, and, although not exhaustive, contains many of the important articles published since 1920, with a few of earlier date. In general, no attempt was made to list abstracts other than those published in *Ceramic Abstracts* and *Journal of the Society of Glass Technology.*

EDITOR'S NOTE: This is the second bibliography to be published by the Society in 1937. The references to the publications are abbreviated in the style used in *Ceramic Abstracts;* the full publication name and address is appended to the Bibliography.

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[1] The Second International Congress on Glass, London, and Sheffield, England, July 2 to 11, 1936.

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Keram. & Steklo (Keramika i Steklo), Gogolevskiĭ Bul'var 27, Moscow, 19, U.S.S.R.

Kolloid-Z. (Kolloid-Zeitschrift), Theodor Steinkopff, Residenzstr. 32, Dresden-Blasewitz, Germany.

Magyar Mérnök. Epit. Kozlönye (Magyar Mérnök-és Epitészegylet Közlönye), Journal of Hungarian Society of

Engineers and Architects, Realtanoda, u. 13–15, Budapest IV, Hungary.

Mitt. Inst. Radiumforschung (Travaux de l'institut d'état de radium (U.S.S.R.); printed in Russian, usually with translated summaries), Goskhimtekhizdat, Leningradskoe Otdelenie, Leningrad, U.S.S.R.

Nature (Nature), Macmillan & Co., 60–62 5th Ave., New York, N. Y.

Physik. Z. Sowjetunion (Physikalische Zeitschrift der Sowjetunion), Akademische Verlagsgesellschaft, Postschliessfach 100, Leipzig C 1, Germany.

Pottery Gaz. (Pottery Gazette & Glass Trade Review), 8 Broadway, Ludgate Hill, London E C 4, England.

Repts. Imp. Ind. Research Inst., Osaka, Japan (Reports of the Imperial Industrial Research Institute, Osaka, Japan), Kōgō-Chōsa Kyōkwai, No. 8 Sanchōme, Sonezaki-cho, Kita-ku, Osaka, Japan.

Rev. Belge Ind. Verrières, Ceram. Èmail. (Revue belge des industries verrières, céramiques et de l'émaillerie), 34 rue d'Arenberg, Brussels, Belgium.

Schnurpfeil's Rev. Glass Works (Schnurpfeil's Review for Glass Works), discontinued with Vol. 14, No. 153 (June 1, 1930).

Sitzber. Akad. Wiss. Wien, Math.-naturw. Klasse (Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematisch-naturwissenschaftliche Klasse), Hölder-Pichler-Tempsky A.-G., Seilerstätte 5, Vienna I, Austria.

Trans. Amer. Ceram. Soc. (Transactions of the American Ceramic Society), The American Ceramic Society, 2525 North High St., Columbus, Ohio.

Verre & Silicates Ind. (Verre et silicates industriels, céramique, émail, ciment), 34 rue d'Arenberg, Brussels, Belgium.

Z. anorg. allgem. Chem. (Zeitschrift für anorganische und allgemeine Chemie), Leopold Voss, Salomonstr. 18b, Leipzig C 1, Germany.

Z. tech. Physik (Zeitschrift für technische Physik), J. A. Barth, Salomonstr. 18b, Leipzig C 1, Germany.

Zhur. Fiz. Khim. (Zhurnal Fizicheskoi Khimiĭ), Gogolevskiĭ Bul'var 27, Moscow 19, U.S.S.R.

CLASSIFICATION OF CERAMIC DINNERWARE

By Arthur S. Watts

As a guide to the consumer who is interested in the utility and service properties of the product rather than in a technical or a historical classification, the following description of dinnerware types is offered in an effort to make essential differences clear and to enable the purchaser to choose such ware as will best serve his needs.

If we disregard decorative treatment which should be considered separately, we can classify all dinnerware on the basis of the body of the ware and the glaze covering the surface. There are three general types of body and three general types of glaze in use today.

Types of Dinnerware Body

Porous Body

A porous body is one through which no light is visible when the article is held between the observer and a strong artificial light or direct sunlight. It is made from natural clays with or without small additions of other materials to aid in strength or other properties of the finished product. When struck with a pencil or similar instrument, the finished product yields a dead or a muffled tone. An ink stain dried on an unglazed surface is permanently absorbed.

Semivitrified Body

A semivitrified body is one of low porosity (4 to 10% water absorption) through which no light is visible except in such ware as approach the minimum porosity indicated and then only in extremely thin sections held between the observer and a strong artificial light or direct sunlight. This body is made from refined clays with additions of materials to promote vitrification and mechanical strength and is fired at a considerably higher temperature than that employed for the porous type body. When struck with a pencil, the finished product yields a tone of intermediate pitch according to the degree of vitrification. An ink stain dried on an unglazed surface will be absorbed to a variable degree but will be definitely faded on washing with water.

Vitrified Body

A vitrified body is one of practically zero porosity (less than 1% water absorption) through which light is visible when held between the observer and any ordinary source of light. This type of body includes many varieties, made from refined materials, and is usually but not always fired at a definitely higher temperature. The body is identified not only by a well-defined translucency but, when struck with a pencil, yields a clear bell-like tone similar to glass. Ink applied to the unglazed surface will not be absorbed and the resulting stain will be removed on washing with water.

Types of Dinnerware Glaze

Soft Glaze

A soft glaze is one which can be scratched readily with a steel point or abraded by scouring soaps and which shows low resistance to chemical attack by strongly alkaline and acid solutions.

Medium Hard Glaze

A medium hard glaze is one of moderate resistance to scratching with a steel point; it has high resistance to abrasion with scouring soaps and high resistance to chemical attack by strongly alkaline and acid phosphate solutions.

Hard Glaze

A hard glaze has extreme resistance to scratching with a steel point, high resistance to abrasion with scouring soaps,

and practically complete resistance to chemical attack of strongly alkaline and acid solutions.

Varieties of Dinnerware

Majolica

Majolica has an extremely porous, opaque, and naturally colored body covered with an opaque, white, or colored soft glaze. Typical examples are the majolicas of Italy and Central Europe, the delftware of Holland, and the highly colored art tableware of the United States.

Fine Earthenware

Fine earthenware has a porous and opaque body covered with a transparent, colorless, or colored soft glaze. Typical examples are Queensware and earthenware of England, the white earthenware of Continental Europe, and a limited production of white earthenware in the United States.

Semivitreous China

Semivitreous china has a partially vitrified, white, or ivory body with very weak or no translucency and is covered with a medium hard glaze. Typical examples are the so-called "semiporcelains" extensively manufactured throughout the United States.

American China (Hotel China)

American china (hotel china) has a vitrified white or colored body of moderate translucency. This body contains a large amount of quartz by which a high resistance to mechanical shock is imparted. It is covered with a transparent medium hard glaze. Manufactured only in the United States. Produced in their shapes for household use and in heavy weights for restaurant service.

English China (Bone China)

English china (bone china) has a vitrified,* extremely white body of pronounced translucency due to a large content of bone ash. It is covered with a transparent soft glaze which is not adapted for severe service. Bone china is not manufactured extensively except in England.

Belleek China

Belleek china has a vitrified, ivory body of pronounced translucency due to a large content of feldspar glass. It is covered with a transparent soft glaze which is not adapted for severe service. Typical example, the Belleek china of Ireland. A dinnerware of similar type but possessing superior mechanical strength is manufactured in limited quantity in the United States.

Porcelain

Porcelain has a vitrified body of pronounced translucency due to extreme purity of the constituent materials and extreme temperatures employed in firing. It is covered with a transparent, colorless, hard glaze which is matured with the body and possesses extreme resistance to abrasion. Porcelain originated in China and was reproduced in Continental Europe where it constitutes the only type of vitrified dinnerware extensively manufactured today. It is also manufactured in very limited amounts in the United States. Porcelain is also manufactured in Japan, but the body and glaze are matured at definitely lower temperatures and most of it is mechanically inferior to the porcelains of China, Continental Europe, and the United States.

Special Porcelain

A special porcelain of decreased translucency due to high clay content and covered with a transparent or a colored, opaque, hard glaze is also manufactured in special articles for table service in the United States.

Department of Ceramic Engineering
Ohio State University
Columbus, Ohio

* Bone china never has zero absorption.

ACTIVITIES OF THE SOCIETY

MEETING OF THE EXECUTIVE COMMITTEE OF THE BOARD OF TRUSTEES

The Executive Committee of the American Ceramic Society met at the office of G. H. Brown, Rutgers University, New Brunswick, N. J., at 3:00 P.M. on April 12, 1937. Those present were G. H. Brown, P. D. Helser, V. V. Kelsey, R. B. Sosman, and F. C. Flint.

The meeting was held preceding a dinner and joint meeting of the Rutgers Ceramic Club and the Ceramic Association of New Jersey.

Organizing Committee, Institute of Ceramic Engineers

The Committee voted to approve the appointment of an Organizing Committee for the proposed Institute of Ceramic Engineers, to consist of a chairman, a vice-chairman, a secretary, and two other members, with authority to circularize the membership of the American Ceramic Society and to determine (1) those who are interested in becoming members of the proposed Institute and (2) what type of by-laws (particularly concerning qualifications for membership) will be acceptable to those wishing to become members; the results of this inquiry are to be reported as early as convenient to the Executive Committee.

The following Organizing Committee was then appointed:

Chairman: J. L. Carruthers, Ohio State University, Columbus, Ohio.

Vice-Chairman: R. E. Birch, Harbison-Walker Refractories Co., Pittsburgh, Pa.

Secretary: C. M. Dodd, Missouri School of Mines, Rolla, Mo.

Additional members: E. H. Fritz, Westinghouse Electric & Mfg. Co., Derry, Pa., and H. E. White, Lava Crucible Co., Zelienople, Pa.

Appointed Representatives for 1937–38

Appointments of representatives to other organizations were made as follows:

American Association for the Advancement of Science

W. J. McCaughey, Ohio State University, Columbus, Ohio

American Foundrymen's Association

Chairman: L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis, Mo.

J. L. Lowe, Box 4, Muskegon Heights, Mich.

G. A. Bole, O. S. U. Engineering Experiment Station, Columbus, Ohio

Paul Bechtner, American Colloid Co., 363 W. Superior St., Chicago, Ill.

American Society for Testing Materials

Committee C-8 on Refractories: N. W. Taylor, Pennsylvania State College, State College, Pa.

Committee E-1 on Methods of Testing: F. H. Norton, Massachusetts Institute of Technology, Cambridge, Mass.

Committee A-1 on Steel: H. F. Staley, Metal & Thermit Corp., New York, N. Y.

Committee C-3 on Brick: A. F. Greaves-Walker, Univ. of North Carolina, Raleigh Branch, Raleigh, N. C.

Committee C-10 on Hollow Masonry Building Units: R. C. Purdy, American Ceramic Society, 2525 N. High St., Columbus, Ohio

Committee C-14 on Glass and Glass Products: J. C. Hostetter, Hartford-Empire Co., Hartford, Conn.

Committee D-3 on Gaseous Fuels: C. H. Parmelee, 210 Warham St., Syracuse, N. Y.

Committee D-9 on Electrical Insulating Materials: L. E. Barringer, General Electric Co., Schenectady, N. Y.

American Society of Mechanical Engineers

Petroleum Division: H. R. Straight, Straight Engineering Co., Adel, Iowa

Process Division: W. Keith McAfee, Universal Sanitary Mfg. Co., New Castle, Pa.

American Standards Association

Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment, A-40: P. D. Helser, General Ceramics Co., New York, N. Y.

Committee C-29: D. H. Rowland, Locke Insulator Corp., Baltimore, Md.

Committee on Safety Code, Safety Glass: A. E. Marshall, 501 Fifth Avenue, New York, N. Y.

Committee Z-10, Letters, Symbols, and Abbreviations: L. E. Barringer, General Electric Co., Schenectady, N. Y.

International Association for Testing Materials

A. S. Watts, Dept. of Ceramic Engineering, O. S. U., Columbus, Ohio

International Congress on Glass and Ceramics

J. C. Hostetter, Hartford-Empire Co., Hartford, Conn.

International Union of Chemistry

Alexander Silverman, Univ. of Pittsburgh, Pittsburgh, Pa.

Inter-Society Color Council (temporary)

Chairman, V. H. Remington, B. F. Drakenfeld & Co., Washington, Pa.

A. C. Hardy, Massachusetts Institute of Technology, Cambridge, Mass., and J. H. Young, du Pont Co., R. & H. Chemicals Dept., Perth Amboy, N. J.

Illuminating Society and Luminous Glassware Guild

Chairman, H. H. Blau, Corning Glass Works, Macbeth-Evans Div., Charleroi, Pa.

R. A. Miller, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

R. R. Shively, B. F. Drakenfeld & Co., Washington, Pa.

A. N. Finn, National Bureau of Standards, Washington, D. C.

National Research Council

Division of Geology and Geography: R. B. Sosman, U. S. Steel Corp., Kearny, N. J.

Division of Chemistry and Chemical Technology: J. C. Hostetter, Hartford-Empire Co., Hartford, Conn.

Orton Foundation Board

J. M. McKinley, North American Refractories Co., Cleveland, Ohio.

Permanent Committee on Simplification of Sizes and Varieties of Vitrified Paving Brick

O. W. Renkert, Metropolitan Paving Brick Co., Canton, Ohio

The following special committee was continued for another year:

Committee on Dust Hazard

Chairman: F. C. Flint, Hazel-Atlas Glass Co., Zanesville, Ohio

Edward Schramm, Onondaga Pottery Co., Syracuse, N. Y.

J. C. Hostetter, Hartford-Empire Co., Hartford, Conn.

L. H. Milligan, Norton Company, Worcester, Mass.

The President was authorized to inquire into the desirability of having a representative of the Society on an A.S.T.M. Committee on Structural Clay Products, and J. R. Kauffman was named as the Society's representative in the event that such representation is arranged.

An invitation from the American Association for the Advancement of Science to hold a meeting in conjunction with the Association meeting at Ottawa in June, 1938, was considered but no action was taken. The President was authorized to represent the Society at this meeting or to appoint someone in his place.

Plans for the New Orleans Meeting in 1938 were considered.

NOTE: The Committee on Data of the Society, F. P. Hall, Onondaga Pottery Co., Syracuse, N. Y., *Chairman*, has been augmented by J. C. Hostetter, Hartford, Conn., and Walter A. Weldon, Baltimore, Md. These members will assist Dr. Hall in assembling a list of Ceramic Reference Books which is now in preparation.

CERAMIC INTERESTS IN THE DIVISION OF GEOLOGY AND GEOGRAPHY OF THE NATIONAL RESEARCH COUNCIL

The American Ceramic Society has one representative in the membership of thirteen that makes up the Division of Geology and Geography of the National Research Council, whose annual meeting was held on May 1 at the National Academy of Sciences Building in Washington. In addition to the members of the Division, the chairmen and many of the members of its numerous subsidiary committees were in attendance. The thorough mimeographed reports from these committees and the active discussion of the reports during two half-day sessions showed that considerable stimulation of coöperative research has been accomplished through the medium of the Council.

The work of many of the Committees, such as those on Micro-Paleontology, Measurement of Geologic Time, Research in Areas of International Concern, is not of direct ceramic interest, but there are some whose work is likely to be of value to ceramic science and technology and to which ceramists can make useful contributions.

Committee 16 on Borderland Fields between Geology, Physics, and Chemistry (T. S. Lovering, University of Michigan, Chairman) has prepared a list of research projects of the kind indicated in its title, appraised their significance, and considered the facilities available in universities and elsewhere for carrying out these researches. The summarized report will be available this summer and can be studied with profit by the Committees on Research of the American Ceramic Society.

An offshoot of this activity is Committee 17 on a Handbook of Physical Constants of Geological Materials (Francis Birch, Harvard University, Chairman), which will welcome the coöperation of the American Ceramic Society Committee on Data. The work is under way, but the test of the work will come in the judgment shown in limiting and selecting the data finally assembled. The coöperation of a sympathetic publisher, the most important essential, is believed to be assured.

Committee 12 on Sedimentation (P.D. Trask, U. S. Geological Survey), has already issued important assemblages of papers on the numerous problems of sedimentary geology, in which the ceramists, as the principal users of clays and shales, are directly concerned. An elaborate symposium of printed contributions on recent marine sediments, including the recent clays, is its next undertaking.

Allied to the Committee on Sedimentation is Committee 13 on Stratigraphy (C. O. Dunbar, Yale University, Chairman) which is attempting the Metternichian task of securing agreement on correlations and nomenclature among individuals whose natural instinct is to disagree at as many points as possible. Elaborate charts of the Cretaceous (Atlantic and Gulf Coast), Tertiary, and Silurian are in shape for publication. It is to be hoped that they will be associated in some way with a recognized and widely distributed publication, such as the *Journal of Geology*, else they will be lost to sight like so many specially published items in the past. The American Ceramic Society's recently published correlation of the fire clays[1] should be fitted into this picture.

Other committees that we should keep track of are Committee 1 on Accessory Minerals (A. N. Winchell, University of Wisconsin); Committee 2 on Conservation of the Scientific Results of Drilling (A. C. Tester, University of Iowa); and Committee 18 on Density Currents (H. N. Eaton, National Bureau of Standards), which is looking into the newly discovered phenomena of the independent flow of silt- and clay-bearing waters.

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[1] J. R. Chelikowsky, "Geologic Distribution of Fire Clays in the United States," *Jour. Amer. Ceram. Soc.*, **18** [12] 367–90 (1935).

Activities of this kind are always in danger of ending in futility if they are not backed with funds or self-sacrificing services. The Council has money with which to pay at least a part of the expenses of its members to attend meetings and conferences. It has no funds of its own for the direct support of research, but acts as a disinterested public trustee for research funds from other sources. It disburses from $120,000 to $150,000 annually for post-doctorate fellowships in research, which have served to introduce some of our best research men into fields where they are now profitably employed. A new step this year in connection with the administration of these fellowships has been their assignment to a single committee representing all the sciences, with a preliminary winnowing of applicants by Divisional committees. Previous fellowships have been confined to physics, chemistry, biology, and medicine. This year, for the first time, two geological fellowships have been granted.

To insure more active prosecution of its research projects, the Division voted to establish a Committee on Research, whose real function will be that of a Congressional Committee on Ways and Means, to secure the necessary funds and qualified personnel rather than depend upon volunteer and more or less discontinuous effort.

Chester R. Longwell, professor of geology at Yale University, was elected Chairman of the Division for the three-year term ending in June, 1940, succeeding Edson S. Bastin of the University of Chicago.

—ROBERT B. SOSMAN

BY-LAWS OF THE AMERICAN CERAMIC SOCIETY

Submitted by Rules Committee, W. Keith McAfee, Chairman, and Adopted by the Board of Trustees, June, 1937

Article I. Government*

(1) The Board of Trustees shall meet at least annually within a week of the Annual Meeting of THE SOCIETY. The Board of Trustees may meet oftener at the call of the President, or of the Executive Committee, or of a majority of the members of the said Board. The General Secretary shall give notice to the Trustees of all meetings of the Board at least twenty (20) days prior thereto.

(2) A majority of the Board of Trustees shall constitute a quorum.

(3) At any regularly called meeting, by a majority vote of its members present, the Board of Trustees may adopt or amend Rules in harmony with the Constitution and By-Laws.

(4) A By-Law or a Rule, or any amendment of either, shall take effect immediately upon its adoption by the Board of Trustees and shall be published to the membership in the next succeeding regular publication of THE SOCIETY.

(5) Every question which shall come before a meeting of THE SOCIETY, or of the Board of Trustees, or of a committee, shall be decided by a majority of the votes cast, unless otherwise provided in the Constitution, the By-Laws or the Rules, or by the laws of the State of Ohio.

(6) When the President or the Executive Committee wishes or is required by the Constitution to submit a question to the Board of Trustees, and the calling of a special meeting of the said Board is impractical, the General Secretary, acting under the instruction of the President or the Executive Committee, may submit said question by letter ballot accompanied by a full statement of the question. The question shall be decided by the affirmative or negative vote of a majority of the entire Board of Trustees.

(7) Fifty voting members shall constitute a quorum at the annual business meeting or any special meeting of THE SOCIETY, or to modify proposed amendments to the Constitution as provided in Art. XV (2) thereof.†

(8) Rules contained in Roberts' Rules of Order, Revised shall govern THE SOCIETY in all cases to which they are applicable, when not inconsistent with the Constitution, By-Laws, or Rules of THE SOCIETY.

Article B II. Purpose

Article B III. Membership

(1) The method of electing applicants to the several grades of the membership shall be as follows:

(*a*) Honorary Members shall be nominated by at least ten (10) Members or Fellows. Their names shall be submitted to the Fellows either in meeting assembled or by letter ballot. If approved in either case by ninety per centum (90%) of those Fellows voting, their names shall be presented by the Dean of Fellows to the Board of Trustees. Election to Honorary Membership shall be by the unanimous affirmative vote of the Board of Trustees from those so nominated and approved.

(*b*) The President of the associations and societies listed by the Board of Trustees in the Rules of THE SOCIETY shall automatically become Ex-Officio Honorary Members upon election to their respective offices and shall hold such membership only during the term of their respective incumbencies.

Other officers of said listed associations and societies or officers of other associations and societies may be specifically elected Ex-Officio Honorary Members by the Board of Trustees for the terms of their respective incumbencies.

(*c*) The methods to be used in judging the qualifications and determining the eligibility of nominees for election as Fellows shall be as set forth in the Rules of the Fellows not inconsistent with the Constitution and By-Laws. The said Rules of the Fellows shall provide for

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* "The Proposed Constitution" was published in *Bull. Amer. Ceram. Soc.*, **15** [6] 200–203 (1936); the ballot count showing its adoption was published in *ibid.*, [10] 364.

Amendments to the Constitution were published in *Bull. Amer. Ceram. Soc.*, **16** [4] 176 (1937); their adoption has been approved by letter ballot of the members of the Society.

† *Ibid.*, **15** [6] 202 (1936).

nomination forms which comprise the signatures of the nominee's sponsors and a full record of his educational, professional, and other qualifications. When nominees for election as Fellows have been approved by the Fellowship Board as provided in the Constitution and in the Rules of the Fellows, the Dean of Fellows shall so certify on their respective nomination forms and submit their names together with said forms to the President of THE SOCIETY for ratification by the Board of Trustees.

(*d*) Election of Members shall be as provided in the Rules.

(*e*) Election of Corporation Members shall be as provided in the Rules.

(*f*) Election of Student Members shall be as provided in the Rules.

(2) Transfer of Fellows, Members, and Corporation Members to Life Fellows, Life Members, and Life Corporation Members, respectively, shall be as provided in the Rules.

(3) Membership Certificates signed by the President may be issued to Honorary Members, Members, or Corporation Members as provided in the Rules of THE SOCIETY and to Fellows as provided in the Rules of the Fellows, provided that a member of any grade of the membership, except an Honorary Member, shall agree to surrender his certificate upon resigning from membership, being dropped for nonpayment of dues or fees, or upon expulsion from THE SOCIETY.

Article B IV. Executive Committee

(1) The new Board of Trustees shall, before the close of each Annual Meeting, or within thirty (30) days thereafter by letter ballot, elect four (4) of its members to comprise, in company with the President of THE SOCIETY, an Executive Committee and shall delegate to it such powers as the said Board in its discretion may wish to, subject to the limitations of the laws of the State of Ohio.

(2) The Executive Committee shall meet at least three times a year between Annual Meetings of THE SOCIETY, and have such powers as are specifically delegated to it by the Board of Trustees. Meetings shall be held at the call of the President or any three members of the Committee. Action by the Executive Committee shall be by the affirmative or negative vote of at least three members thereof.

(3) Minutes of each meeting of the Executive Committee shall be promptly distributed to each member of the Board of Trustees. Three Trustees may, upon written petition, require the President to submit any action of the Executive Committee to the consideration of the Board of Trustees as provided in Article B I Sections (1) and (6) hereof. The decision of the Board of Trustees shall prevail.

Article B V. Dues and Fees

(1) The dues and fees for the several grades of the membership shall be as follows:

(*a*) Honorary Members shall be exempt from all dues and fees and shall be entitled to one copy each of *The Journal and Ceramic Abstracts* and *The Bulletin*.

(*b*) Ex-Officio Honorary Members shall be exempt from all dues and fees.

(*c*) Fellows shall pay a total minimum annual fee of twelve dollars and fifty cents ($12.50), four dollars and fifty cents ($4.50) of which shall be a subscription to *The Journal and Ceramic Abstracts*, and one dollar and fifty cents ($1.50) of which shall be a subscription to *The Bulletin*. Any amount paid as an annual fee, and so designated by a Fellow, in excess of twelve dollars and fifty cents ($12.50) shall be credited to the Fellowship Fund as authorized in Article IX, Section (4), of the Constitution of THE SOCIETY.

(*d*) Members shall pay a total annual fee of twelve dollars and fifty cents ($12.50), four dollars and fifty cents ($4.50) of which shall be a subscription to *The Journal and Ceramic Abstracts*, and one dollar and fifty cents ($1.50) of which shall be a subscription to *The Bulletin*.

(*e*) Corporation Members shall pay a minimum annual fee of twenty-five dollars ($25.00), four dollars and fifty cents ($4.50) of which shall be a subscription to *The Journal and Ceramic Abstracts*, and one dollar and fifty cents ($1.50) of which shall be a subscription to *The Bulletin*.

(*f*) Student Members shall pay an annual fee of five dollars ($5.00), four dollars ($4.00) of which shall be a subscription to *The Journal and Ceramic Abstracts*, and one dollar ($1.00) of which shall be a subscription to *The Bulletin*.

(2) The annual fees specified in Section (1) hereof shall be payable the first day of each January. The privileges of membership in the respective grades shall begin upon the initial payment of the said annual fee, except that the amount of the fee may be reduced for those joining after the first day of July as provided in the Rules.

(3) Any member whose annual fees are in arrears more than one year may be suspended by the Board of Trustees until such arrears are paid. The Board of Trustees may drop any member from the membership list whose annual fees are in arrears more than one year and six months. The mailing of the publications of THE SOCIETY to any member whose annual fees are in arrears may be suspended at the discretion of the Board of Trustees.

Article B VI. Officers

(1) The amount of bond required to be furnished by the General Secretary shall be as specified in the Rules.

(2) The amount of bond required to be furnished by the Treasurer shall be as specified in the Rules.

(3) The accounts of the Secretary and Treasurer shall be audited before each Annual Meeting by a Certified Public Accountant or some other competent person designated by the Board of Trustees.

Article B VII. Nominations and Elections

(1) Prior to the Annual Meeting of THE SOCIETY each year, each Class of THE SOCIETY and each Division of THE SOCIETY shall elect, by secret written ballot, one member of the Executive Nominating Committee which shall be designated Nominating Committee A.

(2) Prior to the Annual Meeting of THE SOCIETY each year, each Class of THE SOCIETY and each Division of THE SOCIETY shall elect by secret written ballot, one member of an additional Nominating Committee which shall be

designated Nominating Committee B. There shall be no other Nominating Committees.

(3) The method of nominating and electing the President, Vice-President, and Treasurer shall be as follows:

(*a*) Each of the two Nominating Committees shall select a Chairman from its own membership and prepare an independent ticket for the offices of President, Vice-President, and Treasurer. Each Nominating Committee Chairman shall, after obtaining the assent of the nominees of his Committee, transmit their names to the General Secretary at least seventy-five (75) days before the opening date of the Annual Meeting of THE SOCIETY.

(*b*) The General Secretary shall prepare ballots as prescribed in the Rules and mail one to each member entitled to vote at least sixty (60) days before the opening date of the Annual Meeting. Only those ballots received at the offices of THE SOCIETY more than seven (7) days before the opening date of the Annual Meeting shall be counted.

(*c*) The President shall appoint three (3) scrutineers to count the ballots and report the results of the election to the President on or before the opening date of the Annual Meeting. A plurality of affirmative votes cast shall elect.

(4) (*a*) The nomination and election of Trustees representing Classes of the Society shall be as prescribed in their respective Class Rules not inconsistent with the Constitution.

(*b*) The nomination and election of Trustees representing Divisions of THE SOCIETY shall be as prescribed in their respective Division Rules not inconsistent with the Constitution.

(5) (*a*) In event of refusal to act, incapacity to act, or the resignation of a Trustee representative of a Class, the members of such Class shall elect a successor to fill the unexpired term as provided in the rules of such Class not inconsistent with the Constitution.

(*b*) In the event of refusal to act, incapacity to act, or the resignation of a Trustee representative of a Division, the members of such Division shall elect a successor to fill the unexpired term as provided in the Rules of such Division not inconsistent with the Constitution.

Article B VIII. Classes

(1) (*a*) The Classes of THE SOCIETY shall be as follows: The Institute of Ceramic Engineers of the American Ceramic Society.

(*b*) Additional Classes of THE SOCIETY may be constituted by the Board of Trustees by amending subsection (*a*) above on petition as provided in the Rules.

(2) Each Class shall have power to make such Rules, elect such officers, and conduct such business as a majority of its members may deem proper, subject, however, to the Constitution and By-Laws of THE SOCIETY. They shall have no technical sessions nor present papers as a Class.

(3) Each Class shall have power to establish such grades of membership and qualifications therefor as it may deem proper and to provide for the election thereto exclusively from the Fellows and members of THE SOCIETY.

A member's privileges in THE SOCIETY are determined by the Constitution, By-Laws, and Rules of THE SOCIETY and shall not be affected in any way by election to any grade of membership in a Class.

(4) The provisions of the Constitution, By-Laws, and Rules of THE SOCIETY shall govern the procedure of all Classes, but no action or obligation of a Class shall be considered an action or obligation of THE SOCIETY.

No officer of a Class shall have power to obligate THE SOCIETY in any way without specific approval of the Board of Trustees.

Article B IX. Fellows
Article B X. Divisions

(1) (*a*) The Divisions of THE SOCIETY shall be as follows:

Art Division
Enamel Division
Glass Division
Materials and Equipment Division
Refractories Division
Structural Clay Products Division
Terra Cotta Division
White Wares Division

(*b*) Additional Divisions may be added by amending sub-section (*a*) above on petition as provided in the Rules.

(2) Each Voting Member shall instruct the General Secretary in which Division he wishes to be enrolled for the privilege of voting. Such Division affiliation may be changed by the Voting Member by notifying the General Secretary.

(3) A Division shall not expend funds of THE SOCIETY or incur indebtedness without the formal approval of the Board of Trustees.

(4) The Provisions of the Constitution, By-Laws, and Rules of THE SOCIETY shall govern the procedure of all Divisions, but no action or obligation of a Division shall be considered an action or obligation of THE SOCIETY. This By-Law shall be imprinted on any publication issued by a Division.

Article B XI. Local Sections and Student Branches

(1) Local Sections, each carrying some distinguishing title prefixed to the words ". . . . . Section of THE AMERICAN CERAMIC SOCIETY," may be authorized by the Board of Trustees under the following conditions:

(*a*) Application for permission to form a Local Section shall be made as provided in the Rules.

(*b*) The charter of a Local Section may be temporarily suspended by the Board of Trustees for cause, or withdrawn by the Board of Trustees for cause after sixty (60) days notice to the Chairman of the said Local Section.

(*c*) The officers of a Local Section shall include a Chairman, Secretary, Treasurer, and Councillor. They shall be elected annually by the Local Section and have the duties usually pertaining to such offices. The Councillor shall advise the Local Section in all matters pertaining to its relations with THE SOCIETY and make an annual report to the Chairman of the Committee on Sections and Divisions regarding the work and status of the Local Section.

(*d*) Members of a Local Section need not be members of THE SOCIETY, but the Councillor must be a Fellow or Member.

(2) A Local Section shall not expend funds of THE

SOCIETY or incur indebtedness in the name of THE SOCIETY.

(3) The provisions of the Constitution, By-Laws, and Rules of THE SOCIETY shall cover the procedure of all Local Sections, but no action or obligation of a Local Section shall be considered an action or obligation of THE SOCIETY. This By-Law shall be imprinted on any publication issued by a Local Section.

(4) Each Local Section shall have power to make such rules, elect such officers, and conduct such business as it may deem proper, subject, however, to the Constitution, By-Laws, and Rules of THE SOCIETY.

(5) Student Branches, each carrying some distinguishing title prefixed to the words ". . . . . Student Branch of THE AMERICAN CERAMIC SOCIETY," may be authorized by the Board of Trustees under the following conditions:

(*a*) Application for permission to form a Student Branch shall be made as provided in the Rules.

(*b*) The charter of a Student Branch may be temporarily suspended by the Board of Trustees for cause, or withdrawn by the Board of Trustees for cause after sixty (60) days notice to the Chairman of the said Student Branch.

(*c*) The officers of a Student Branch shall include a Chairman and Secretary. They shall be elected annually by the Student Branch and have the duties usually pertaining to such offices.

(*d*) The Board of Trustees shall appoint a Councillor for each Student Branch. He shall be a Fellow or Member of THE SOCIETY. It shall be his duty to advise the Student Branch in all matters pertaining to THE SOCIETY and he shall make an annual report to the Chairman of the Committee on Sections and Divisions regarding the work and status of the Student Branch.

(6) A Student Branch shall not expend funds of THE SOCIETY or incur indebtedness in the name of THE SOCIETY.

(7) The provisions of the Constitution, By-Laws, and Rules of THE SOCIETY shall cover the procedure of all Student Branches, but no action or obligation of a Student Branch shall be considered an action or obligation of THE SOCIETY. This By-Law shall be imprinted on any publication issued by a Student Branch.

(8) Each Student Branch shall have power to make such rules, elect such officers, and conduct such business as it may deem proper, subject, however, to the Constitution, By-Laws, and Rules of THE SOCIETY.

Article B XII. Committees

(1) The Standing Committees of THE SOCIETY shall be as follows:

(1) Rules	(6) Research
(2) Publications	(7) Geological Survey
(3) Membership	(8) Data
(4) Standards	(9) Ceramic Education
(5) Sections and Divisions	(10) Industrial Management

(2) The Committee on Rules shall consist of the chairman of the Rules Committee of those Classes having such committees, and the chairman of the Rules Committee of those Divisions having such committees. The Chairman shall be appointed by the Board of Trustees. It shall perform such duties as required by the Board of Trustees relating to interpretation or amendment of the Constitution, By-Laws, or Rules of THE SOCIETY.

(3) The Committee on Publications shall consist of a Chairman and three members, appointed by the Board of Trustees. The editor of the publications of THE SOCIETY shall be an ex-officio member of the Committee. The duties of this Committee shall be as follows:

(*a*) The Committee shall nominate to the Board of Trustees an editor, or editors, for the publications of THE SOCIETY.

(*b*) The Committee shall perform such additional duties as are prescribed in the Rules, and shall act in a general advisory capacity to the Board of Trustees in all matters pertaining to the publications of THE SOCIETY.

(4) The Committee on Membership shall consist of the chairman of the Membership Committee of those Classes having such Committees, and the chairman of the Membership Committee of those Divisions having such committees. The Chairman shall be appointed by the Board of Trustees. It shall undertake the enlargement of the membership of THE SOCIETY among those interested in the ceramic and allied industries. It shall have power to appoint subcommittees with the permission of the Board of Trustees.

(5) The Committee on Standards shall consist of a Chairman appointed by the Board of Trustees, and Subcommittees as follows:

(*a*) Subcommittee A on Definitions, consisting of three members appointed by the Board of Trustees.

(*b*) Subcommittee B on Raw Material Specifications, consisting of three members appointed by the Board of Trustees.

(*c*) Subcommittee C on Standardization of Tests, consisting of one member appointed by each Division.

(*d*) Subcommittee D on Standardization of Products, consisting of one member appointed by each Division.

(6) The Committee on Sections and Divisions shall consist of a Chairman and four members appointed by the Board of Trustees in addition to the Chairman of each Division. Its duties shall be to act in an advisory capacity to the Board of Trustees on all matters pertaining to the welfare of Divisions, Local Sections, and Student Branches.

(7) The Committee on Research shall consist of one member appointed by each Division and a Chairman appointed by the Board of Trustees. It shall act in an advisory capacity to the Board of Trustees in matters pertaining to research, and shall organize and encourage scientific investigations and arrange symposia pertaining to the ceramic and related industries, especially those investigations which will stimulate the development of our national industries and resources.

(8) The Committee on Geological Surveys shall consist of a Chairman and four members appointed by the Board of Trustees. It shall act in an advisory capacity to the Board of Trustees in matters pertaining to Geological Surveys and shall perform such duties as the Board of Trustees may deem proper in connection therewith.

(9) The Committee on Data shall consist of one member appointed by each Division and a Chairman appointed by the Board of Trustees. It shall prepare for publication monographs, bibliographies, statistics, etc., under the direction of the Board of Trustees.

(10) The Committee on Ceramic Education shall be appointed by the Board of Trustees. It shall consist of five as follows: a ceramic engineer, a ceramic technologist, a ceramic artist, a ceramic educator, and a ceramic industrialist. They shall be appointed for a term of five years each and the senior member of the Committee shall be the Chairman. When a Class of the Society is constituted which embraces one of the above categories, the representative of that category on this Committee shall be the Chairman of the Committee on Education of that Class. The Committee shall act in an advisory capacity to the Board of Trustees.

(11) The Committee on Industrial Management shall consist of one member appointed by each Division and a Chairman appointed by the Board of Trustees. It shall act in an advisory capacity to the Board of Trustees in matters pertaining to Industrial Management and promote discussions and papers relating thereto.

(12) The Board of Trustees may, from time to time, appoint such special committees and delegate to them such powers as it may deem proper, subject, however, to the Constitution, By-Laws, and Rules of THE SOCIETY.

SAIL ON YE MEMBERS

With twelve (12) additional members this month and dues paid by others, the membership count is now 65 Personal and 3 Corporation below the March 29 peak. This represents a shifting or turnover which occurs annually; less this year than is usual.

Sail On! It is imperative that the Personal and the Corporation support be increased if this Society is to function up to its possibilities for industrial ceramics.

1937 MEMBERSHIP RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
December 20, 1936	1452	196				
January 20, 1937	1478	199				
February 23, 1937	1579	210	19	515	220	2543
March 29, 1937	1613	212	18	524	220	2587
April 23, 1937	1517	209	29	485	220	2460
May 22, 1937	1541	209	25	501	220	2496

NEW MEMBERS

Personal

BANGS, WILLIAM C., 634 5th Ave., West, Hendersonville, N. C.; ceramic engineer, Moland-Drysdale Corp., Etowah, N. C.

BURKE, L. R., 5418 Normlee Place, Pittsburgh, Pa.; Pittsburgh district manager, Charles Taylor Sons Co.

CAPPER, A. M., Continental Roll & Steel Foundry Co., Furnace Division, Coraopolis, Pa.

GODBER, ARNOLD B., S. S. White Dental Mfg. Co., Prince Bay, Staten Island, N. Y.; chemist.

*IRBY, WILLIAM, General Electric Co., River Works, W. Lynn, Mass.

KNOBLAUGH, WALTER C., 225 E. Market St., Tiffin, Ohio; ceramic engineer, Basic Dolomite, Inc., Maple Grove, Ohio.

LÉON, FRANCK, 14 Avenue Emmanuel, Haren-Nord-lez-Bruxelles, Belgium; enamel manufacturer.

SHIMMAN, NORMAN C., 13615 Ohio Ave., Detroit, Mich.; assistant (Research Dept.), Ceramic Division, Champion Spark Plug Co.

SHINGLETON, JAMES W., Ellwood Co., Ellwood City, Pa.; enamel room foreman. (Formerly in name of Charles W. Carbeau.)

TOABE, KEBE, 524 Jersey Ave., Elizabeth, N. J.; manager, Elizabeth Plate Glass Co.

Student

ECHAVARRIA, NORMAN, New York State College of Ceramics.

LEWIS, MARVIN O., Pennsylvania State College.

RIGGS, S. GRAHAM, JR., Raleigh Unit, University of North Carolina.

* Indicates former member of the Society rejoining for 1937.

Membership Workers' Record

Personal			
J. L. Carruthers	1	R. R. Robinson	1
A. F. Greaves-Walker	1	Leonard G. Tait	1
Robert W. Knauft	1	Office	2
F. H. Norton	2		
Student			
R. M. Campbell	1	Office	1
A. F. Greaves-Walker	1	**Grand Total**	**12**

ROSTER CHANGES DURING MAY

Corporation

GLADDING, MCBEAN & Co., M. F. Johansen (voter), Lincoln, Placer County, Calif. (Former voter, Atholl McBean, San Francisco, Calif.)

Personal

CAMPBELL, G. DONALD, 1201 Freeport Rd., Tarentum, Pa. (Clarksburg, W. Va.)

DODD, ARTHUR E., Mellor Laboratories, Shelton, Stoke-on-Trent, England. (Glamorgan, England)

ELLIOTT, A. W., Covered Wagon Ranch, Cloverdale, Calif. (Huntington Park, Calif.)

ERICKSON, HENRY W., Bush House, Suite 133, Aldwych, London, W. C. 2. (New York, N. Y.)

GROSSMAN, HAROLD, American Lead Pencil Co., Hoboken, N. J. (Montclair, N. J.)

GUASTAVINO, RAFAEL, 500 Fifth Avenue, New York, N. Y. (Fort Lauderdale, Fla.)

HAVELL, RICHARD F., 13 Ashland Ave., River Forest, Ill. (Student, Univ. of Illinois)

HOLSCHER, H. H., Owens-Illinois Glass Co., General Research Lab., Westwood Ave., Toledo, Ohio. (Maywood, Ill.)

HOWER, EDWIN N., 5759 Howe Street, Pittsburgh, Pa. (Munhall, Pa.)

KLINE, Z. C., 15122 Terrace Rd., East Cleveland, Ohio. (Niles, Ohio)

MALSCH, WERNER, 402 6th Ave., Belmar, N. J. (Miami Beach, Fla.)

MCCREERY, GEORGE L., 393 Highland Ave., Wadsworth, Ohio. (Barberton, Ohio)

MORGAN, WILLARD L., 3 Forestdale Park, Calumet City, Ill. (Hammond, Ind.)

MUNRO, R. ARCHIBALD, 550 W. Main St., Lock Haven, Pa. (Niagara Falls, N. Y.)

PLANK, ROSS D., 3446 Madera, Los Angeles, Calif. (Hermosa Beach, Calif.)

PLUSCH, JOHN A., 11 High St., Westfield, Mass. (Philadelphia, Pa.)

WHITE, MILO A., JR., Swindell-Dressler Corp., Box 1888, Pittsburgh, Pa. (Fremont, Mich.)

WILLIAMS, ARTHUR E., 1004 Nevada St., Urbana, Ill. (Peoria, Ill.)

MAKE PLANS FOR THE 1938 (40TH) ANNUAL MEETING IN NEW ORLEANS MARCH 27—APRIL 2

MODERN NEW ORLEANS

New Orleans often is thought of as an Old World mystery hiding behind a laughing mask, but the modern side of New Orleans is equally as interesting as the old. Canal Street is the dividing line. This 171-foot wide street is America's widest business thoroughfare and, to give it individuality, the sidewalks and neutral ground are paved with marble with deep pink borders.

New Orleans' strong economic position can be attributed to its location on the Mississippi River, 107 miles from the Gulf of Mexico, which puts the city in easy reach of the ports of the world.

In addition, nowhere else in this country may be found such a complete coördination of the four major transportation agencies: trunk-line railroads, inland waterways, coastwise steamship service, and overseas steamship service. Railroad trunk lines entering New Orleans constitute more than 20% of the class 1 railroad mileage of the country. Barge lines operate from New Orleans to Minneapolis, St. Paul, St. Louis, Pittsburgh, Birmingham, Chicago, and to points in Texas. Coastwise-steamship service is offered to the Atlantic seaboard, to the Pacific Coast, and to ports on the Gulf of Mexico. The foreign steamship service to and from New Orleans to all parts of the world is more extensive and regular than from any other American port except New York. To handle the tremendous amount of business that clears through the port, New Orleans has erected facilities and river improvements that are valued at 200 million dollars.

New Orleans is also an industrial center of the first magnitude. One of the reasons for this is that practically all of the raw materials needed in many industries are easily available in the surrounding areas, such as oil, sulfur, salt, forest products; or they can be imported through the port. There are more than one thousand manufacturing plants in and around New Orleans and in a normal year they turn out products valued at nearly 300 million dollars: sugar, bags, alcohol, celotex, petroleum, coffee, etc.

In all parts of the city, there are evidences of modern achievements. Shushan Airport, which aviation authorities declare is one of the finest in the world, is a monument to progress; so is the magnificent Huey P. Long Bridge, the Mississippi River's finest span; and the Bonnet Carre Spillway, which makes New Orleans immune from river floods.

These and many other achievements tell of the progress that New Orleans has made even during depression years. More ambitious plans have been laid for the future to be told in such accomplishments as the repaving of streets, the construction of a new eight million dollar Charity Hospital, a new federal building, city hall, French Market, and a lake-front development that is going to make that section of New Orleans one of the country's outstanding residential spots.

The Personalities of New Orleans

Every city has a dominant characteristic that may be found in its industries, its commercial attainments, its historic associations, its cultural achievements, its intellectual pursuits, or in some other distinguishing feature.

This dominant characteristic gives individuality to the city possessing it and this individuality, when marked, gives the city its personality.

What is the dominant characteristic that gives New Orleans its personality?

Is it the port? No. The port is not the one distinctive feature of the city.

Is it the Vieux Carre? Ah! The Vieux Carre is a lovely old section with unique and mysterious charm, but it is not the sole attribute that identifies the city.

Is it the Mardi Gras? A colorful and unique celebration, to be sure, but not the one symbol of the city's individuality.

Is it the balmy climate, its year-round recreation facilities, its lovely parks, its tropical foliage, or its beautiful homes? Hardly, for none of these, in itself, carries with it the label, "I am the personality of New Orleans."

What, then, constitutes the personality of New Orleans? None of these just mentioned; yet all of them and more. You can discover the dominant characteristic of New Orleans only when you gather together its Vieux Carre, its buildings, port, parks, food, Mardi Gras, and many other distinguishing features. If all of these could be gathered into one large stimulus, then New Orleans would appear as the city superb, as the city not with a single personality but with many charming personalities. Looking at New Orleans from this point of view, your imaginations, your ambitions would be stirred by the names and the deeds of Bienville, Lafitte, Jackson, Beauregard, Tulane, Audubon, and the many others whose achievements in the fields of education, science, art, commerce, and war have contributed to the greatness that is New Orleans.

Their achievements, their romances, and their adventures still endure and can be traced and felt today in the historical scenes in which they were enacted. They stretch from one iron-wrought French balcony in the Vieux Carre to another. They linger in every Spanish courtyard and are also to be found in the cosmopolitan atmosphere of modern New Orleans.

The Mississippi River at Canal Street is 2200 feet wide and the depth in the New Orleans harbor ranges from 100 to 180 feet in midstream and is 30 to 60 feet alongside the wharves at low water.

The Port has a water frontage of 133 miles, of which 50 miles is on the Mississippi River and 11 miles on the Inner Harbor Navigation Canal.

The Port limits include all of Orleans Parish (New Orleans) and parts of Jefferson, St. Bernard, and Plaquemines parishes.

New Orleans is 300 to 600 miles nearer to the Panama Canal than are ports of the Atlantic and, therefore, 300 to 600 miles nearer to the entire west coast of North and South America and the Orient.

Louisiana territory, now divided into all or part of seventeen states, became part of the United States in 1803, when Kentucky planters and trappers threatened to secede from the Union unless they were protected in their natural right of free access to world markets through the Port of New Orleans.

When Thomas Jefferson sent a commission to France to treat with Napoleon for the purchase of New Orleans, Talleyrand declined to sell only New Orleans because, "without New Orleans all of Western America is valueless to us." Forthwith he agreed to sell all of Louisiana territory, with New Orleans, for $15,000,000.

With the inbound and outbound movement evenly balanced among a wide variety of general commodities, New Orleans is easily America's second most important port, fully equipped to serve efficiently as the gateway for Mississippi Valley products moving to world markets and the gate whereby world materials may move to valley production centers.

LOCAL SECTIONS

BALTIMORE-WASHINGTON SECTION

The Baltimore-Washington Section held a meeting in Baltimore, Md., May 8, 1937. In the afternoon, a tour of the Chemistry Department at Loyola College was made. R. B. Schmitt showed a number of thin sections of rocks and organic crystals, using a newly acquired projector attached to a petrographic microscope. The visitors were also much interested in the completely equipped laboratory for microchemical analysis. Father Schmitt, having had considerable experience as a sugar chemist, gave a talk on the manufacture of sugar, exhibiting numerous samples of materials obtained at various stages in the manufacturing process. Lantern slides were also shown.

Dinner was served at 6:30 P.M. at The Longfellow; forty-nine members and guests were present. Chairman Clarence Hahner conducted a short business meeting at which the following officers for the year 1937–1938 were elected:

Chairman: G. H. SPENCER-STRONG, Porcelain Enamel & Mfg. Co., Baltimore, Md.
Vice-Chairman: G. R. SHELTON, National Bureau of Standards, Washington, D. C.
Secretary-Treasurer: J. D. TETRICK, Baltimore Enamel & Novelty Co., Baltimore, Md.

D. H. Rowland, Locke Insulator Corp., gave an illustrated lecture on "Some Recent Research on Insulator Design." The steps in applying laboratory data to the design of insulators were illustrated with a number of charts. Experiments were conducted at the proper intervals in the lecture to show the difference in behavior of glazed porcelain test pieces when the glaze was in tension on one specimen and in compression on another, and breaking tests were made on full-size insulators.

—G. R. SHELTON, *Secretary*

MICHIGAN-NORTHWESTERN OHIO SECTION

The spring meeting of the Michigan-Northwestern Ohio Section was held in Detroit, Friday, May 14, 1937.

In the afternoon, members and guests were shown through the Ceramic Division of the Champion Spark Plug Company. The dinner meeting was held in the tap room of the Koppitz Brewery.

The guest speaker, A. V. Bleininger, gave a brief but interesting "Review of American Pottery."

Seventy-one were in attendance.

— L. E. TAIT, *Secretary*

CALIFORNIA SECTION

At the spring meeting of the California Section, May 1, Chairman E. L. Maxson introduced a distinct novelty in that in addition to an interesting program the attending members were treated to a good floor show at the Café de Paree which lent a social aspect and helped to entertain the ladies present.

The program was particularly interesting in view of the importance of American-made pottery in the present-day market. The topic of Peter Fisher, Manager Parmelee-Dohrmann, Long Beach store, was "The Buyer's Viewpoint in Purchasing Ceramic Ware." Mr. Fisher gave views based upon a long and rich experience as a buyer of ceramics for the retail trade and stressed the importance of having ceramic manufacturers convey to the retail sales people some selling ideas rather than merely to interest the wholesale buyer in the placing of an order.

Glenn Lukens, Head of the Ceramic Department, College of Architecture, University of Southern California, chose for his topic "What Art Can Do for Industrial Ceramics." Mr. Lukens ably pointed out that a happy middle ground exists in which the smartness and style and eye-appeal, characteristic of many widely advertised lines of modern merchandise, can be put into ceramic ware without approaching the extreme *moderne* on the one hand or mediocrity on the other.

The meeting was attended by fifty members of the Local Section, many of whom brought their wives.

—TOM CURTIS, *Vice-Chairman and Corresponding Secretary*

SCHOOL NOTES

CERAMIC ENGINEERING AT IOWA STATE COLLEGE

Paul E. Cox, Head of the Department of Ceramic Engineering of Iowa State College, states that the ceramic engineering course at Iowa State College will be continued. A letter to the Secretary of the Society, written on May 14, 1937, gives definite information relating to the ceramic work there, as well as emphatic denial that the ceramic work might be discontinued.

"I am authorized by Dean T. R. Agg to state that the Ceramic Engineering Department at Iowa State College is to be continued and supported in such a manner that it can resume its rightful place among those schools which, because of the strength of the colleges as a whole, are regarded as important in ceramic education.

"We expect to add a young man to the Engineering Experiment Station who will be called on for a very small amount of teaching work and who fits into the general organization of this campus. My own time will be divided between the teaching work and certain phases of the work of the Engineering Experiment Station.

Research Program

"It is the intention to organize a definite program of research aimed to increase the use of structural materials produced in Iowa by Iowa people. Dean Agg has named a committee, made up of the different individuals of the Engineering Division who have been contributing by small investigations toward a better use of brick and tile.

"For example, at this time, Walter Dunagan, of the Theoretical and Applied Mechanics Department, and in coöperation with the Sheffield Brick and Tile Company, is testing a reinforced hollow tile floor structure, so designed that no false work is necessary in making the installations.

"Henry Giese of the Department of Agricultural Engineering has been a constant worker for many years in the development of new uses of hollow tile on the farm and in residences.

"The Department of Ceramic Engineering has been working this year on the development of a better flue liner, and this work is to be continued under my direction until an answer is found.

"Other members of the Faculty have projects in mind or under way, and the laboratory facilities of the Department of Ceramic Engineering are being found to be decidely helpful in all of these projects. You see, therefore, that research work is to be carried on with the main purpose of helping Iowa industries.

Ceramic Curriculum

"The curriculum has been planned in such a way that a few options permit a student to work toward any objective he likes, either in structural materials or other heavy products or toward enamels or fine pottery. The strictly fundamental work in chemistry, mathematics, and physics has been somewhat increased with the belief that the industries will, after all, be willing to furnish the practical information needed.

"Although the past five years have been discouraging, it is increasingly evident that these adjustments were necessary and that the net results are in the interest of future students.

"The students who are consulted state that they know very little about what the term 'ceramics' means, and that the principal reason for small enrollment is found in the lack of knowledge in this section concerning the importance of the ceramic industries. We have tried hard to make the citizens of the State understand the advantages for the really competent workers in ceramics, and Dean Agg has stated that considerable pressure will be used to prevent overcrowding some departments at the expense of others and to the disadvantage of those which are overcrowded.

"Iowa State College is going to try very hard to hold a

place in the field of ceramic education and to justify having such a curriculum. I can say with pardonable pride that the graduates from Iowa State College justify the maintenance of the curriculum. One of my graduates of a few years ago has just been promoted to a general superintendency, and I am told by the corporation which employs him that my product always fits and is always satisfactory."

—PAUL E. COX

UNIVERSITY OF NORTH CAROLINA, RALEIGH UNIT

Ceramic Students Win Grand Exhibit Prize

At the Annual Engineers' Fair, recently held at the Raleigh Unit of the University of North Carolina, the Student Branch of the American Ceramic Society won the Grand Prize for the best exhibit. The winning exhibit was an attractive display of art pottery made by the students of the department outside of class hours. All of the work done on the Fair was voluntary on the part of the students.

At the May meeting of the Society, the election of officers for the year 1937–38 was held. The officers elected were *President*, Addison Maupin, Raleigh, N. C.; *Vice-President*, J. P. Sawyer, Elizabeth City, N. C.; *Secretary*, Frank Sabol, Youngstown, Ohio; *Treasurer*, C. D. King, Wilmington, N. C.; *Member-at-Large of the Engineers' Council*, J. J. Amero, Gloucester, Mass.; *Alternate Member of the Engineers' Council*, H. S. Gibbs, Moorehead City, N. C.

The retiring officers are A. R. Blackburn, C. D. King, Addison Maupin, W. W. Gaskins, J. L. McLaughlin, and J. J. Amero.

CERAMICS IN THE HERSHEY INDUSTRIAL SCHOOL

Thirteen miles east of Harrisburg, Pennsylvania, lies the model community of Hershey named for the founder, M. S. Hershey, producer of the product which bears his name. On a hill overlooking the beautiful Lebanon Valley stands the Junior-Senior Division of The Hershey Industrial School built and endowed by Mr. Hershey.

Ninth-grade boys at work in the ceramics shop.

This institution is a home and school for 1000 orphan boys who are offered all of those things which the average parents try to provide their children. Numerous homes, housing from 20 to 24 boys, are located at various points on the 10,000 acre tract of land comprising the property of the school.

The Junior-Senior high school, a group of thirteen buildings, offers the regular courses of instruction found in

Robert Engle, winner of First Award and two Honorable Mentions in Tenth National Scholastic Exhibition, 1937, throwing a pot.

Casting, finishing, jiggering, and glaze spraying—all in an orphan's school-day activity.

first-class high schools, namely, academic, commercial, and vocational courses. The vocational department offers training in such trades as agriculture, auto mechanics, electricity, machine shop practice, plumbing and heating, printing, sheet-metal work, arc and acetylene welding, and woodworking.

Included in the group of shops is one unit devoted entirely to ceramics. The ideal lay-out of the shop and the equipment, complete in every detail, presents an unusual ceramic laboratory for a secondary school.

Pupils of the seventh and eighth grades are required to take the work one hour each week as a part of the school's art education program. In the senior high school, boys may elect the activity. The work includes modelling, throwing, mold-making and casting, and jiggering. The preparation and application of glazes as well as the stacking of the kiln is done by the older boys.

Local exhibits of student work have done much to promote ceramic interest among the townspeople. In national competition, the work has been well received. The jury of selection of the Ninth Annual Scholastic Exhibit of Creative Arts and Crafts, 1936, honored the school with two cash awards and two honorable mentions. This year in the same competition, the school was awarded first prize, fourth prize, and four honorable mentions.

The department and its course of study has been developed and carried on by Thomas E. Ryder, a graduate of the College of Fine Arts of the Carnegie Institute of Technology. During the past three summers he has studied at the New York State College of Ceramics at Alfred, N. Y.

Harry Merrill, winner of Fourth Place in the Tenth National Scholastic Exhibition, glazing a piece.

CERAMISTS HONORED BY UNIVERSITIES

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

A. M. Blakely, Ph.D. in Ceramics

Mr. Blakely will receive a degree of Doctor of Science in Ceramics in the June Convocation at the Massachusetts Institute of Technology. In his thesis entitled, "The Life History of a Glaze," he has carried out some important work on the prevention of crazing. Mr. Blakely will be employed after June 15 by the Macklin Company, Jackson, Mich., where he will be engaged in research and development. —F. H. NORTON

PENNSYLVANIA STATE COLLEGE

Advanced Degrees in the Department of Ceramics

February Commencement, 1937

Doctor of Philosophy

BENNETT S. ELLEFSON (B.S., St. Olaf College, 1932; M.S., Univ. of Minn., 1933).

Thesis: (1) "The Sessile Drop Method for Determination of Surface Tension and Density of Viscous Liquids at High Temperatures"; (2) "The Sessile Drop Method for Study of the Nature of Glass-Metal Adherence at High Temperatures."

Master of Science

EDWARD P. MCNAMARA (B.S., N. Y. State College of Ceramics, 1935).

Thesis: "Elastico-Viscous Properties of a Soda-Lime-Silica Glass at Temperatures near the 'Transformation Point.'"

June Commencement, 1937

Master of Science

PAUL S. DEAR (B.S., Virginia Polytechnic Inst., 1927; M.S. Mech Eng., Virginia Polytechnic Inst., 1932).

Thesis: "Elastic and Viscous Properties of Several Soda-Silica Glasses in the Annealing Range of Temperature."

RONALD E. GRIFFITHS (B.S., Penn State, 1933).

Thesis: "Studies on the Formation of Pink Chromium Stains."

August Commencement, 1937

Doctor of Philosophy

PAUL L. SMITH (B.S., Illinois Wesleyan Univ., 1934; M.S., Penn State, 1935).

Thesis: "Studies on the Structure of Silicate Glasses by the Method of Gas Diffusion."

Master of Science

GEORGE S. BACHMAN (B.S., Penn State, 1936).

Thesis: "The Effect of p_H on the Electrical Charge of Particles of Certain Clays."

NOTE: The Pennsylvania State College does not grant honorary degrees.

NEW YORK STATE COLLEGE OF CERAMICS

Honorary Degree, Doctor of Science

* John Clyde Hostetter, Hartford-Empire Company, Hartford, Conn.

Professional Degrees of Ceramic Engineer

C. Forrest Tefft, The Claycraft Company, Columbus, Ohio

Donald Hagar, Manager, Personal Sales Engineering, Zanesville, Ohio

J. E. Eagle, Vitro Manufacturing Co., Pittsburgh, Pa.

UNIVERSITY OF ILLINOIS

February, 1937

Doctor of Philosophy in Engineering

W. R. Morgan

June, 1937

Master of Science in Ceramic Engineering

W. W. Coffeen

C. H. Zwermann

Master of Science in Ceramics

L. R. Barrett

UNIVERSITY OF WASHINGTON

June 14, 1937

Engineering Degree in Ceramics

Fred T. Heath (B.S. in Ceramic Engineering, 1922).

MISSOURI SCHOOL OF MINES AND METALLURGY

Doctor of Science in Chemistry

FRANK JOSEPH ZVANUT was born in St. Louis, Mo., August 30, 1911. He received his elementary training at St. Aloysius Parochial School and was graduated from McBride High School in 1927. In September, 1928, he entered the Missouri School of Mines at Rolla, Missouri, and received the degree of Bachelor of Science in Ceramic Engineering from that school in 1932. The following year he acted in the capacity of research fellow of the U. S. Bureau of Mines, Nonmetallics Station, Seattle, Wash., and was awarded the degree of Master of Science in Ceramic Engineering by the University of Washington in June, 1933.

From that time, until September, 1936, he was a graduate assistant in the Ceramic Department of the Missouri School of Mines and Metallurgy, where he pursued his studies for the degree of Doctor of Philosophy in Chemistry as a student of the University of Missouri. He received this degree on May 28, 1937.

Since September, 1936, Mr. Zvanut has been employed in the Research Department of the Ferro Enamel Company, Cleveland, Ohio.

He is a member of Tau Beta Pi, Phi Kappa Phi, and Sigma Xi (Associate), as well as the professional societies of Keramos, Alpha Chi Sigma, and the American Ceramic Society.

OHIO STATE UNIVERSITY

Doctor of Science in Ceramic Engineering

At the Ohio State University Convocation, June 14, 1937, the following persons received their Ph.D. degree in Ceramic Engineering:

CARL EDWARD CURTIS, Columbus, Ohio. B.A. (College of Puget Sound 1919); M.Sc. (University of Washington) 1925; Research Engineer, O. S. U. Engineering Experiment Station since 1934.

ROBERT FULLINGTON REA, Columbus, Ohio. B.Cer.E. (Ohio State University 1934). Orton Fellow, O. S. U. Engineering Experiment Station since 1935.

Professional Degrees of Ceramic Engineer

The Professional Degree of Ceramic Engineer was conferred on the following engineer graduates:

E. E. BALDAUF (B.Cer.E. 1923): National Tile Co., Anderson, Ind.

R. E. BIRCH (B.Cer.E. 1927): Harbison-Walker Refractories Co., Pittsburgh, Pa.

R. E. GOULD (B.Cer.E. 1925): Tennessee Valley Authority, Norris, Tenn.

W. M. HUGHES (B.Cer.E. 1924): S. A. Weller Co., Zanesville, Ohio.

T. A. KLINEFELTER (B.Cer.E. 1915): National Bureau of Standards, Washington, D. C.

E. H. LINTZ (B.Cer.E. 1918): Taylor, Smith, & Taylor Co., East Liverpool, Ohio.

D. M. MCCANN (B.Cer.E. 1922): Akron Porcelain Co., Akron, Ohio.

J. T. ROBSON (B.Ch.E. 1919, M.Sc. 1920, Ph.D. 1933, Chem. Engineer 1933): Allied Engineering Co., Cleveland, Ohio.

R. B. SOSMAN (B.S. 1903, Ph.D. from M.I.T. 1907): U. S. Steel Corp., Kearny, N. J.

L. J. TROSTEL (B.Ch.E. 1918, Chemical Engineer 1936): General Refractories Co., Baltimore, Md.

R. C. ZEHM (B.Met.E. 1921): Joseph Dixon Crucible Co., Jersey City, N. J. —A. S. WATTS

* For biographical sketch see *Bull. Amer. Ceram. Soc.*, **15** [7] 257 (1936). Bucknell University conferred a Doctor of Science degree on Dr. Hostetter, June 8, 1936.

Membership in American Ceramic Society
FOR CONTINUING EDUCATION IN CERAMICS

LAMME MEDALS AWARDED IN 1937 TO ELLIS LOVEJOY AND EDGAR COLLINS BAIN

The 1937 award of the Lamme Medals was made to Ellis Lovejoy, Charter Member of the American Ceramic Society, and to Edgar Collins Bain, B.Sc., Ohio State University, 1912. The medals were presented at the 1937 Convocation Exercises at Ohio State University, June 14.

Ellis Lovejoy

Mr. Lovejoy was born April 5, 1860, in Columbus, Ohio. He attended a primary grade school in Columbus; the village school, North Wayne, Maine, one winter term; the Maine Wesleyan Seminary, Kents Hill, Maine; completed a grammar grade school, Columbus, Ohio, 1874–75; Central Ohio Normal School, Worthington, Ohio, 1875–77; entered Ohio State University in spring, 1879, and reëntered in fall, 1880; was graduated from Ohio State University June, 1885.

During the winters of 1877 to 1880 he taught country school; he was assistant, Ohio Geol. Survey, stratigraphy, coal mapping, and anticlinal surveys, 1883, 1885–86. In 1888 he made a report on the Pomeroy and Federal Creek Coal Fields which was published in Volume VI of the Ohio Geological Survey.

During 1886 and 1887, he was chemist at the Columbus Brick and Terra Cotta Company, Union Furnace, Ohio; from 1887 to 1903 he was superintendent at the same plant.

During 1903 and 1904, he was general manager of the Imperial Clay Company, New Lexington, O.

From 1903 to 1928, Mr. Lovejoy was consulting engineer in mining and ceramics. During this period (1906–16), with W. D. Richardson, he organized the Richardson-Lovejoy Engineering Company; 1906–1907, with W. D. Richardson, he organized the Scott Kiln Drying Company. In his engineering work, Mr. Lovejoy "saw America first"—every state in the Union, all of the provinces of Canada (except Prince Edward Island), Alaska, and some of Mexico. From 1928 to 1933, he was director of research at the Orton Memorial Laboratory, Columbus, Ohio.

Mr. Lovejoy retired from active business on February 1, 1933.

Original Products Developed

In 1886, Mr. Lovejoy developed a dry-pressed fire brick using plastic and flint fire clay and ganister.

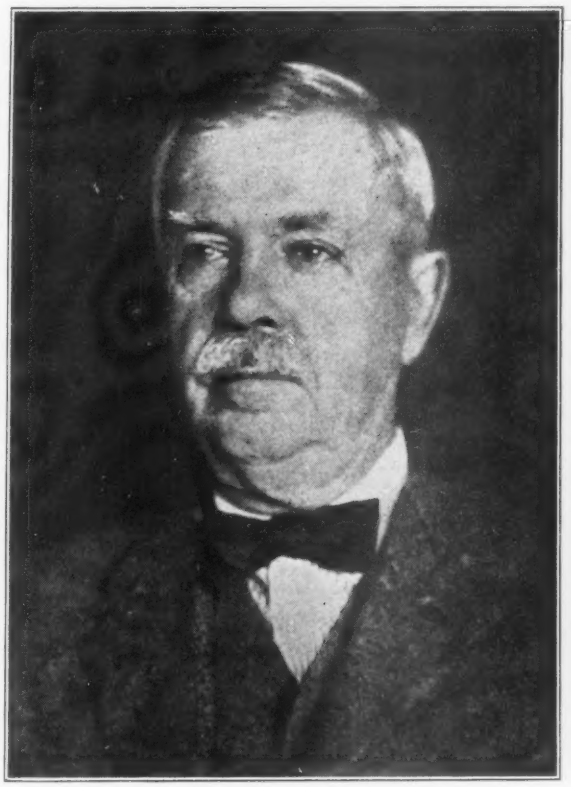
During the period 1886–1903, he developed the following face-brick products: (1) terra-cotta colored face brick; (2) manganese gray face brick; and (3) a buff, a gray, and a deep red face brick heavily speckled with black (manganese) spots. These were produced in Union Furnace, Ohio.

In 1903, at New Lexington, Ohio, he produced the wire-cut texture face brick, machine-made. This was the real start of a great era of texture-surfaced brick throughout the United States.

Colors and effects produced, some original as above noted, were plain red; light and dark buff; terra-cotta color; light and dark gray; black-speckled buff, gray, and red; straw-colored salt-glazed brick (an original dry-pressed product); white (dry-pressed) enameled brick.

All of the above were marketed, the majority of them widely, some experimentally, to feel out the market and thus provide a future marketable product as need arose. All were natural clay mixtures except the manganese colored products.

Mr. Lovejoy has been actively identified with the development and growth of the American Ceramic Society: Charter Member (1899); Vice-President of the Society in 1905; Treasurer from 1906–1913; and President 1913–1914. In 1933, he was made a Life Member of the



Ellis Lovejoy

American Ceramic Society. For the past three years he has served on the Editorial Committee of the Structural Clay Products Division.

He has also been elected to the Legion of Honor in the American Institute of Mining and Metallurgical Engineers.

Publications of Ellis Lovejoy

Mr. Lovejoy, through his many active years in structural clay products work, has contributed valuable books and papers to the literature. The following list has been compiled.

"Report on the Pomeroy and Federal Creek Coal Fields," *Ohio Geol. Survey*, Vol. VI, 1888.

"Clays of Five Mile Creek," *Ohio Mining Jour.*, **17**, 34 (1888); abstracted in *Bull. Amer. Ceram. Soc.*, **4** [8] 382 (1925).

Scumming and Efflorescence. Pamphlet, F. J. Heer Printing Co. (1907). 60 pp.

"Discolorations on Brick," *Brick*, **30**, 97 (1909); trans-

lated in *La Céramique*, **12,** 101; abstracted in *Bull. Amer. Ceram. Soc.*, **4** [8] 392 (1925).

"Dry-Pressed Brick," *Trans. Amer. Ceram. Soc.*, **7,** 232–50 (1905).

"Settle Records," *ibid.*, pp. 416–19.

"Use of Barium Compounds in Preventing Scum," *ibid.*, **8,** 255–65 (1906).

(With T. W. Garve) "Kiln Temperatures from Coal and Producer Gas," *ibid.*, **12,** 93–113 (1910).

"Presidential Address," *ibid.*, **16,** 53–64 (1914).

Drying Clay Wares. T. A. Randall & Co., Indianapolis, Ind. (1916). 168 pp.

"Use of Car Tunnel Kilns for Brick and Other Products of Crude Clays," *Jour. Amer. Ceram. Soc.*, **1** [1] 628–36 (1918).

"Notes on Fire Clays of the Northern Appalachian Coal Basin," *ibid.*, **2** [5] 374–90 (1919).

Burning Clay Wares. T. A. Randall & Co., Indianapolis, Ind. (1920). 348 pp. 3 editions.

"Coloration, Discoloration, and Other Burning Effects," *Clay-Worker*, **79,** 38–39 (1923); *Ceram. Abs.*, **2** [5] 97 (1923).

"Burning a Downdraft Kiln," *Clay-Worker*, **78,** 346–48 (1922); *Ceram. Abs.*, **2** [1–2] 3 (1923).

"Theory of Coal-Measure Fire Clays," *Jour. Amer. Ceram. Soc.*, **8** [11] 756–61 (1925).

"Valuation of Clay Properties," *Clay-Worker*, **87** [2] 135–36 (1927); *Ceram. Abs.*, **6** [4] 156 (1927).

Scum on Clayware, Its Cause and Prevention. Foote Mineral Co., Philadelphia, Pa. (1927); complete digest with illustrations in *Tonind.-Ztg.*, **52** [53] 1073–77 (1928); *Ceram. Abs.*, **8** [4] 272 (1929).

"Scum and Efflorescence," *Clay-Worker*, **92** [3] 205–208; [5] 347–48 (1929); *Ceram. Abs.*, **8** [12] 881 (1929); **9** [2] 105 (1930).

Effects on Clays of Pyrite and Gypsum, Vol. 1, No. 2, *Foote Prints*, Foote Mineral Co. (1928).

(With H. B. Henderson) "Stiff-Mud Die Troubles," *Jour. Amer. Ceram. Soc.*, **13** [11] 787–93 (1930); republished in Germany in *Keram. Rundschau* and in France in *Revue des Materiaux de Constuction et de Travaux Publics.*

(With H. B. Henderson) "Early Brickmaking and Some Old Brick Buildings in Virginia," *Clay-Worker*, **94** [1] 19–23; [2] 104–107 (1930); *Ceram. Abs.*, **9** [10] 844; [11] 938 (1930).

(With H. E. CoVan) "Laboratory Equipment for Stiff-Mud Tests, Including Exhaustion of the Air," *Jour. Amer. Ceram. Soc.*, **14** [8] 533–40 (1931); article of same title in *Clay-Worker*, **95** [2] 125–27 (1931).

"Effects of De-Airing on Strength of Stiff-Mud Products in the Wet State," *Jour. Amer. Ceram. Soc.*, **15** [4] 231–33 (1932).

"Water Movement in Stiff-Mud Ware and Its Relation to Drying," *ibid.*, **16** [9] 405–11 (1933).

(With T. W. Garve and W. D. Richardson) "Drying Clay Products," *Clay-Worker*, **100** [1] 12–14 (1933); *Ceram. Abs.*, **12** [10–11] 386 (1933).

"Classification of Florescence," *Bull. Amer. Ceram. Soc.*, **13** [1] 22–23 (1934).

"Coal Requirements of Various Ceramic Ware in Firing," *ibid.*, **13** [7] 176–78 (1934).

(With J. T. Robson and W. D. Richardson). "Ceramic Ware Firing Symposium," *ibid.*, **13** [10] 276–80 (1934).

Fundamentals and Economies in the Clay Industries. Randall Publishing Co., Wellsville, N. Y. (1935), ii + 361 pp.; the chapters in this book were published in the *Clay-Worker* in 1931 and 1932 (Vol. 95 and Vol. 96); for book review see *Ceram. Abs.*, **14** [9] 236 (1935); Volumes 10, 11, 12, and 13 contain abstracts from the *Clay-Worker* articles.

"Draft-Pressure Factor in Heat Distribution," *Bull. Amer. Ceram. Soc.*, **14** [2] 93–95 (1935).

Brick, American. Encyclopedia Brittanica, Vol. IV, 13th ed. (1929).

Fire Brick, U. S. Practice, Encyclopedia Brittanica, Vol. IX, 13 ed. (1929).

There are also numerous articles and discussions written by Mr. Lovejoy under various pen names, usually that of Carey P. Ellis (most of these were published in *The Clay-Worker*).

History of Lamme Medal

The Lamme medals were established by the late Benjamin G. Lamme, 1888, Ohio State University, for "meritorious achievements in engineering of the technical arts."

When Mr. Lamme died in 1924, he left $6000 to endow the medals to be given annually. They were awarded in 1931 for the first time.

The Lamme medal is of gold, about $2^1/_2$ inches in diameter, and is valued at $200. It was executed by Erwin F. Frey of the Fine Arts Department. In addition to the Medal, Mr. Lamme also endowed two scholarships given annually to the best junior in the Departments of Mechanical Engineering and Electrical Engineering.

The recipients of the medals have been the following men:

1931, Charles E. Skinner and A. C. Fieldner.
1932, A. V. Bleininger (Charter Member, American Ceramic Society) and R. D. Mershon.
1933, Norman V. Storer.
1934, Lewis Warrington Chubb.
1935, Colonel George Arthur Burrell.
1936, Ervin John Bailey.
1937, Ellis Lovejoy and Edgar Collins Bain.

HEWITT WILSON—DOCTOR OF SCIENCE—MONTANA SCHOOL OF MINES, JUNE 5, 1937

Record of Hewitt Wilson

Born, Columbus, Ohio, February 28, 1891, English-Scotch ancestry.

Graduated East High School, Columbus, Ohio, 1908.

Summer-time jobs: South Columbus, Buckeye Steel Casting Co. (finishing department); Deckman-Duty Brick Co., Cleveland, Ohio; Fredericksburg Brick Co., Fredericksburg, Ohio; Ceramic Laboratory, Ohio State Geological Survey.

Mosaic Tile Co., Zanesville, Ohio, 1911–1912; a year of practical experience in all departments.

Graduated from the Ceramic Engineering Department, Ohio State University, with the degree of Ceramic Engineer, 1913.

Northern Clay Co., Auburn, Wash., 1913–1917, in terra cotta manufacture as ceramic engineer and chemist.

Ohio State University, Assistant Professor in Ceramic Engineering, 1917–1919.

Conkling-Armstrong Terra Cotta Co., Philadelphia, Pa., consultant, 1918.

Renwick and Cunliffe, Vancouver, B. C.; survey of clays and their testing from southern British Columbia, 1919.

University of Washington, 1919 to present time: Assistant Professor of Ceramic Engineering, 1919 to 1925; Associate Professor, 1925 to 1927; Professor, 1927 to present; director of ceramic work from 1919 to present time.

United States Bureau of Mines, Northwest Experiment

Station, Seattle. Consulting ceramist and engineer in nonmetallics, 1919 to present time.

Professional degree in Ceramic Engineering, Ohio State University, 1936.

Society of Sigma Xi: secretary, vice-president and president of the University of Washington chapter, 1926 to 1930; member of the Nominating Committee at present.

American Ceramic Society, Fellow, and member Geological Survey Committee.

Pacific Northwest Section, American Ceramic Society and P. N. W. Clayworkers' Association, organizer and secretary, 1923 to 1937.

American Association of University Professors, secretary of the University of Washington chapter, 1935–1936.

Washington State Planning Council, committee on nonmetallics and industrial minerals.

University of Washington Research Club, membership committee for 3 years.

American Society for Testing Materials, Committee on Refractories.

American Association for the Advancement of Science, member.

Montana School of Mines, Butte, Montana: consulting professor in ceramic engineering for two years, 1934 to 1936, during the establishment of a section in ceramic engineering.

Consulting ceramic work for numerous companies, including Gladding, McBean, and Co., Seattle, Wash., Washington Brick, Lime, and Sewer Pipe Co., Spokane, Wash., Clayburn Co., Ltd., Vancouver, B. C., Willamina Clay Products Co., Portland, Ore., and Idaho Fire Brick Co., Troy, Idaho.

Publications by Hewitt Wilson

1. "Deformation Study of Kaolin-Feldspar Mixtures," *Trans. Amer. Ceram. Soc.*, **15**, 217–32 (1913).
2. "Pinholing and Peeling of Terra Cotta," *ibid.*, **19**, 209–15 (1917).
3. "Overglaze Colors at Cones 6 to 7," *ibid.*, pp. 653–58.
4. "A Cobalt-Uranium Green Glaze for Terra Cotta," *Jour. Amer. Ceram. Soc.*, **1** [4] 238–46 (1918).
5. "Polychrome Decoration of Terra Cotta with Soluble Metallic Salts," *ibid.*, **1** [5] 353–66 (1918).
6. "Notes on Terra Cotta Slips with Reference to the Use of Asbestos and Chlorite Mica," *ibid.*, **3** [2] 114–33 (1920).
7. "An Oxygen-Acetylene High Temperature Furnace," *ibid.*, **4** [10] 835–41 (1921).
8. "Preliminary Report of the Clays of Idaho (by F. H. Skeels); (clays tested under direction of Hewitt Wilson), *Idaho Bur. Mines and Geol. Bull.*, No. 2 (1920).
9. "The Ceramic Engineering Department of the University of Washington, Seattle," *Jour. Amer. Ceram. Soc.*, **6** [1] 110–14 (1923).
10. Abstracts of Terra Cotta literature. Mimeographed at the Univ. of Washington and distributed to members of the Terra Cotta Division of the American Ceramic Society and used by the Ceramic Engineering Dept., Univ. of Illinois, 1923.
11. "Our Ceramic Family," *Clayworker*, **79**, 552–53 (1923); *Ceram. Abs.*, **2** [10] 229 (1923).
12. (With A. L. Bennett and F. T. Heath) "Preliminary Report of the Residual Kaolin and Feldspar in the Pacific Northwest," *Jour. Amer. Ceram. Soc.*, **6** [3] 475–90 (1923).
13. "Tentative Methods of Sampling Clay Deposits and for Sampling Ceramic Materials as Delivered," *ibid.*, **4** [No. 6, Part II] 6–8 (1921).
14. "Auger Machines and Die Working," *Brick Clay Rec.*, pp. 342, 344, 346 (Sept. 4, 1923).
15. "Clays and Shales of Washington," *Univ. of Washington Eng. Expt. Sta. Bull.*, No. 18, 224 pp. (Oct., 1923).
16. "High-Temperature Load and Fusion Tests of Fire Brick from the Pacific Northwest in Comparison with Other Well-Known Brick," *Jour. Amer. Ceram. Soc.*, **7** [1] 34–51 (1924).
17. "Uniformly Better Clay Products," *Brick Clay Rec.*, **64** [12] 872–75 (1924).
18. "Notes on Ceramic Engineering Education," *Jour. Amer. Ceram. Soc.*, **8** [10] 519–26 (1925).
19. (With C. E. Sims and F. W. Schroeder) "Artificial Sillimanite as a Refractory," *ibid.*, **7** [11] 842–55; [12] 907–19 (1924).
20. "Manufacture of Architectural Terra Cotta," mimeographed at the Univ. of Washington, Nov. 1, 1925; *Bull. Amer. Ceram. Soc.*, **5** [2] 94–145 (1926).
21. Ceramics, Clay Technology. McGraw-Hill Book Co., New York, first ed., 1927. 296 pp.; *Ceram. Abs.*, **6** [11] 547 (1927).
22. "Progress Report on the Efflorescence and Scumming of Mortar Materials," *Jour. Amer. Ceram. Soc.*, **11** [1] 1–31 (1928).
23. "Some Feldspathic Materials of the Pacific Northwest," *U. S. Bur. Mines Rept. Invest.*, No. 2794, 13 pp. (Feb., 1927); *Ceram. Abs.*, **6** [7] 302; [9] 399 (1927).

Hewitt Wilson

24. "Action of Weather on Clay Products," *Foote Prints*, **1** [4] 19–29 (1928).
25. "Ochers and Mineral Pigments of the Pacific Northwest," *U. S. Bur. Mines Bull.*, No. 304, 74 pp. (1929); *Ceram. Abs.*, **9** [3] 229 (1930).
26. "Firing Clay Ware," *Fuels and Fur.*, **8** [2] 181–86 (1930); *Ceram. Abs.*, **9** [10] 867 (1930).
27. "Elementary Ceramic Procedure," *Denver (Colo.) Fire Clay Co. Bull.*, No. 360 (1930).
28. "Alumina–Silica System and Its Relation to Ceramic Engineering," *Bull. Amer. Ceram. Soc.*, **10** [6] 152–59 (1931).
29. "Buckling of Wall Tile," *Jour. Amer. Ceram. Soc.*, **15** [4] 252–60 (1932).
30. (With H. G. Wilcox) "Electrical Dewatering of Portland Cement Slurry," *Concrete-Cement Mill Sec.*, (April, May, and June, 1932).

31. (With G. A. Page) "Simple Dispersion Test for Clays," *Jour. Amer. Ceram. Soc.*, **16** [2] 82–85 (1933).
32. (With J. A. Cunliffe) "Refining of Pacific Northwest Kaolins by Air Flotation," *ibid.*, **16** [3] 154–62 (1933).
33. (With Frank Zvanut) "Properties of Quartz Sands Washed from Kaolins of the Pacific Northwest," *Univ. of Washington Eng. Expt. Sta. Bull.*, No. 88, 42 pp, (Jan., 1936).
34. (With J. A. Pask) "Talc and Soapstone in Washington," *Amer. Inst. Min. and Met. Engrs.* [Preprint] 25 pp. (Feb., 1936); *Ceram. Abs.*, **15** [4] 132 (1936).
35. (With G. A. Page and V. S. Cartwright) "Dewatering Clay Suspensions by Spray Evaporation," *U. S. Bur. Mines Rept. Invest. Bull.*, No. 3248, 42 pp. (Jan., 1935); *Ceram. Abs.*, **14** [4] 103 (1935); **15** [8] 252 (1936).
36. "Iron Oxide Mineral Pigments of the U. S.," *U. S. Bur. Mines Bull.*, No. 370, 198 pp. (1933); *Ceram. Abs.*, **13** [6] 160–61 (1934).
37. (With Frank Zvanut) "Pyrometric Cone-Equivalent Values for the CaO–Al_2O_3–SiO_2 System," *Jour. Amer. Ceram. Soc.*, **17** [8] 255–56 (1934).
38. (With George Middleton) "Microscopic Study of Russian Chinaware," *Bull. Amer. Ceram. Soc.*, **14** [3] 101–104 (1935).
39. (With K. G. Skinner) "Factors for the Calculation of Ceramic and Nonmetallic Minerals," *Jour. Amer. Ceram. Soc.*, **17** [4] 93–115 (1934).
40. "Kaolin and China Clay in the Pacific Northwest," *Univ. of Washington Eng. Expt. Sta. Bull.*, No. 76, 184 pp. (1934); *Ceram. Abs.*, **14** [2] 51 (1935).
41. (With K. G. Skinner) "Chalk and Whiting of the U. S.," *U. S. Bur. Mines Bull.*, No. 395 (1937) (in press).
42. (With K. G. Skinner) "Equations and Quadrant Charts for Determining the Heat and Air Requirements of Continuous Driers," *Jour. Amer. Ceram. Soc.*, **20** [4] 99–111 (1937).
43. (With G. J. Middleton) "Purification of Kaolin: Some Data on the Classification of Quartz and Muscovite," *ibid.*, pp. 126–35.
44. (With K. A. Kobe and T. M. Sheehy) "Evaporation by Submerged Combustion: VI, Dewatering Clay Suspensions," *Jour. Amer. Ceram. Soc.* (1937) (in press).

Published under Student Authorship

45. (With Thad O. Smith) "Puget Sound Shales and Glacial Clays," *Jour. Amer. Ceram. Soc.*, **8** [12] 849–52 (1925).
46. (With M. E. Reynolds) "Scumming and Efflorescence," *Bull. Amer. Ceram. Soc.*, **8** [12] 677–83 (1925).
47. (With R. J. Clark) "Laboratory Apparatus for Refining Pacific Northwest Kaolin," *Jour. Amer. Ceram. Soc.*, **10** [2] 98–108 (1927).
48. (With H. N. Baumann, Jr.) "Heat Balance Study of Ceramic Kilns," *ibid.*, **10** [11] 860–96 (1927).
49. (With J. A. Cunliffe and H. E. Clem) "Refractories for Soda Recovery Furnaces in the Pulp and Paper Industries," *ibid.*, **15** [6] 321–33 (1932).
50. (With C. E. Curtis) "Electrical Dewatering of Clay Suspensions," *ibid.*, **14** [3] 219–63 (1931).
51. (With F. J. Zvanut) "Purification and Utilization of Pacific Northwest Quartz and Muscovite Mica," *Ceram. Ind.*, **20** [2] 94–97 (1933).
52. (With K. G. Skinner) "Action of Waste Wood and Oil Fuel on Refractories," *Brick Clay Rec.*, **81**, 204 (1932).
53. (With Howard Mansur) "Heat Balances of Some Ceramic Kilns," *Jour. Amer. Ceram. Soc.*, **14** [2] 89–124 (1931).

Developments in the Ceramic Laboratory at the University of Washington[1]

1. Production and testing of first whiteware (tableware) pottery made in the Pacific Northwest, all from local kaolins, flint, and feldspar.
2. Beneficiation studies of Washington and Idaho kaolins to show methods of treatment and increased values of these clays for refractories, pottery, and paper.
3. Production of mullite (artificial sillimanite) in the electric furnace and its manufacture into refractories.
4. Dewatering studies of kaolin by electrophoresis and spray evaporation.
5. Heat-balance tests of Hoffman continuous and other periodic ceramic kilns.
6. Development of the mercury volumeter for volume-shrinkage determinations in clay testing.
7. Development of the oxygen-acetylene cone-fusion furnace for refractories.
8. Development of a new method for testing the spalling resistance of clay refractories.
9. Development of the panel test for slag resistance of refractories.
10. Development of the high-temperature load value in testing the pressure resistance of refractories at elevated temperatures.
11. Investigation of the iron-oxide mineral pigments of the United States with the coöperation of various state geologists.
12. Investigation of the available sources of chalk and whiting in the United States.
13. Factor tables for the calculation of ceramic and nonmetallic minerals.
14. Quadrant charts for ceramic drying and firing.
15. Free testing laboratory for several thousand clays and nonmetallic minerals from the North Pacific rim.
16. Two chapters for the coming publication on nonmetallic minerals, "Chalk and Whiting" and "Mineral Pigments," The Mudd Memorial volume, American Institute of Mining and Metallurgical Engineers.

[1] With student and coöperative U. S. Bureau of Mines assistance.

THOMAS S. CURTIS, HONORARY DEGREE, DOCTOR OF SCIENCE

University of Southern California

On June 5, Mr. Curtis received the hood and degree of Doctor of Science. Acquiring by diligence, without formal school schedule, a broad and thorough training in physics, chemistry, mathematics, and mineralogy (the four prerequisites in ceramic technology); having naturally the ability to invent, construct, and operate precision instruments and production equipment and processes, Mr. Curtis has contributed voluminously to ceramic technology, science, and art. His contemporary ceramists rejoice in this well-deserved recognition of Mr. Curtis' attainments and contributions.

Boyhood Training

Thomas S. Curtis was born in Red Bank, N. J., May 28, 1889. His father was Thomas Adams Curtis, M.D., and his mother Mary Elizabeth Curtis, née Drohan. He attended Shrewsbury Academy and the public schools of Red Bank, and was graduated from high school in 1904.

Prior to his father's death in 1904, he worked with him with a view to entering the College of Physicians and Surgeons (Columbia University) in 1905, having thus had for several years an unusual opportunity for a scientific viewpoint, since his father was one of the foremost physicians

and surgeons of his day with a splendidly equipped laboratory. The Röntgen ray had just come into practical use and much of their investigation had to do with methods of production of the X-ray and its effect upon human tissue.

Early Years Inventing and Publishing

In the years between 1905 and 1909, Mr. Curtis' hopes and ambitions for entering college were dispelled by the discovery that what was thought to be a sizeable estate proved to consist chiefly in uncollectable accounts receivable, and this period was perforce spent in earning a living for his mother and sister. His work during that period was largely in jobs that had to do with development and investigation and carried him through a practical experience in drafting, machine-shop practice, woodworking, and the design and construction of electrical amd mechanical equipment. During this period, one of his inventions was the three-bladed shutter that today forms a part of the equipment of every motion-picture projector. The addition of the third blade to the shutter made it impossible for the projector to get into synchronism with 60-cycle current and thus eliminated the objectionable flicker that characterized all early motion pictures.

During this five-year period, Mr. Curtis wrote some fifty-odd articles which were published in various electrical, mechanical, and photographic magazines. In 1909 he was offered a position with a publishing house in Boston that issued *American Photography* and *Electrician and Mechanic* magazines. This position of associate editor gave him the opportunity to establish an experimental laboratory and to earn a living in a locality where he felt he might add to his meager education. The accumulation of experimental apparatus that he brought to Boston included the early X-ray equipment that he had built with his father's assistance, and this equipment embraced what must have been one of the earliest examples of high-frequency apparatus, although at the time it seemed merely a convenient means of obtaining the high voltage necessary for the operation of an X-ray tube.

His articles in the Boston publications attracted the attention of several members of the faculty and a few seniors at Massachusetts Institute of Technology, who shortly became frequent visitors to the laboratory. As a result of these friendships an arrangement was made whereby, in exchange for the consultation and use of the equipment he was developing, these friends would give him private tutoring in mathematics, physics, and certain branches of electrical engineering.

This work continued for about five years at the end of which time, Mr. Curtis had developed a complete system of high-frequency apparatus, which later went on the market for therapeutic purposes and which is repeated in practically every commercial electrotherapeutic equipment for the market.

At the end of 1913, he was asked to go to New York to join the staff of a new magazine that was the successor to *Popular Electricity* of Chicago, which magazine took over his old magazine, *Electrician and Mechanic*, under the name of *Modern Mechanics*. Mr. Curtis moved to New York, taking his laboratory and establishing himself in larger quarters, registering a personal business under the name of Curtis Engineering Laboratories Company; the editorial work was placed on an associate or part-time basis. At the same time, he took some much needed chemistry and physics at Columbia and some metallurgy at Cooper Institute. The magazine connection lasted but a year when the combined publications were sold to a newly formed company that bought the name *Popular Science* and started what is now that very successful publication. Feeling that he could not subscribe to the new editorial policy as projected he withdrew and started a little publication of his own which was called *Everyday Engineering* and through the agency of which he issued a series of some thirty handbooks which endeavored to reduce to understandable terms the outlines of the various sciences in a manner that would make these subjects useful to young experimental engineers and researchers.

During this time he also reduced to book form his work in high-frequency equipment and published a 250-page volume, High-Frequency Apparatus, Its Design and Construction, which is in every public library. Smaller books which he published total between thirty and forty volumes.

Furnaces and Refractories

By the end of 1916, Mr. Curtis had gone rather heavily into the study of high-temperature reactions with gas-fired and electrically heated furnaces. The latter included resistance, arc, and induction types. Some one or more of his publications attracted the attention of Frederick G. Cottrell, then Director of the Bureau of Mines in Washington and brought about a meeting which resulted in a warm and lasting friendship. Dr. Cottrell aroused his interest in refractories as also did Frank Antisell who was then superintendent of the Raritan Copper Works.

In April, 1917, upon the entrance of the United States into the World War, Dr. Cottrell brought about a meeting with the heads of the Naval Consulting Board, with the result that Mr. Curtis, his laboratories, and a staff of eleven men were placed at the disposal of the Board for examination and testing of military and naval inventions. This connection, of course, was without remuneration. In 1918, he took the job of research technologist, with the commission of first lieutenant, in the Gas Defense Division, Mechanical Research and Development Section of the Chemical Warfare Service, with headquarters at American University, Washington, D. C.

Vitrefrax Company Formed

Mr. Curtis had visited the Pacific Coast in the service of the Naval Board work and had been much impressed with the huge quantities of bauxitic clay that had been thrown on the dump at Alberhill, California.

After the armistice was signed, Mr. Curtis established a small laboratory in Los Angeles and made a deal with the Alberhill Coal and Clay Company to investigate this refuse clay with a view to finding a use for it. Within a year he had demonstrated the fact that the clay could be treated by high-temperature means to eliminate its shrinkage completely and thus form the basis for the manufacture of the first high-grade fire brick to be manufactured on the Pacific Coast. As a result of this work, the Vitrefrax Company was organized and it immediately started manufacture of the Argon line of refractories, which is the stand-

ard high-temperature refractory in the public utilities and oil industries and in 90% of the sugar mills of the world because of its resistance to bagasse ash.

In 1922, a disastrous fire destroyed the plant of this small but successful Company. The decision to refinance through assessments kept the ownership of the Company in a few hands and wiped out 90% of Mr. Curtis' investment.

Products Developed at Vitrefrax

During this period prior to 1928, the following products were the more important of those released to the market:

(1) Beta-magnesium oxide of high hot dielectric properties which formed the high-temperature insulation in what is now known as the General Electric Company's Calrod heating units used in Hotpoint electrical appliances. The most important patent in this connection is U. S. 1,690,771.

(2) Durox, a synthetically manufactured mullite of controlled crystal to glass ratio, which forms the major ingredients in the A C spark plug and which has been used continously by the A C Spark Plug Company since the latter part of 1924.

(3) Anticipating the trend of automotive engines toward higher compression, an improved form of Durox was developed and made ready for the spark-plug company prior to its request for it, and this Durox today forms the basis of its present core.

(4) Diamel, a synthetic magnesium aluminate spinel, widely used as a lining for red brass induction furnaces in which it piled up many records of million-pound heats per lining. It is interesting to note that although Diamel was in its prime ten years ago, it is during this past year that recognition has come for the product in entirely different lines of the ceramic industry in which the product at that early date was considered a failure.

(5) Forsterite, to which no trade name was applied, was made in the electric furnace and widely sold as a supplemental flux, being used in spark plug and electrical insulator bodies and in many specialty lines. The refractory properties of the pure forsterite and a forsterite-periclase companion product were studied and evaluated.

(6) Durox (refractory grade), which formed the basis of Durox glass-tank blocks is widely used on the Pacific Coast and is successfully employed in many eastern plants because of its purity and entire freedom from deleterious gases when used in the throat and finishing ends of glass tanks.

(7) Dynon, a recrystallized corundum, produced through the aid of a mineralizer, cobaltic oxide, and developed primarily for the production of electric insulators of high tensile strength to eliminate hard ware. Properly made, Dynon bodies exhibit a modulus of rupture in excess of 50,000 pounds per square inch and a tensile strength of higher than 20,000 pounds. No commercial use has been made of the material.

(8) Amorphous mullite: this singular product was made by completely fusing the proper admixture, permitting the fusion to fall into droplets into a powerful jet of water from which it was sprayed as small globules having the composition of mullite but practically devoid of crystallization. Upon grinding and molding this product, subsequent heat treatment at cone 17 resulted in a complete intergrowth of mullite crystals with an extraordinarily small percentage of glassy matrix. This work was done for the A C Spark Plug Company and all rights were reserved for all applications other than spark plugs. Investigation in the laboratories of a large glass company rated the refractory product made from this composition the highest in glass corrosion resistance of any that had been tested up to that time.

(9) There might be included in the list many unnamed special products which were developed to meet peculiar conditions in various industries. One of the most interesting of these perhaps is a compound that was used to prevent oxidation and blow holes in the continuous arc welding of the pipe for the Los Angeles aqueduct. This product was an interesting example of the application of pure theory based upon the use of the phase-rule diagrams, and the final product as manufactured and used in carload quantities was made exactly according to the original formula issued without a single experiment to modify or correct it.

(10) The Vitrox Series: In the studies of the physical structure of ceramic and refractory materials, Mr. Curtis very soon came to have great respect for the influence of a fibrous product introduced in minor percentages in ceramic bodies. This idea resulted in the development of a number of products made from natural ores among which were kyanite, fibrolite, and pyrophyllite, in which a fiber structure was deliberately developed in the process of manufacture; this fiber, later introduced into special refractory shapes, sagger bodies, and whiteware bodies, brought about considerable increase in toughness and resistance to cracking. More than thirty thousand tons of these products have been sold and used in the ceramic industry in the past ten years.

Thomas S. Curtis

(11) The last market release was Plastic Vitrox which was derived from a natural ore, a trachyte, and which combined a most unique plasticity and green strength with practically all of the elements required for a fine triaxial body when a small amount of ball clay was added. The development work on this product consisted in working out a flow sheet which included grinding in water with a controlled hydrogen-ion value. This feature proved to have an important influence upon the arrangement of particles, *i.e.*, the proper coating of the nonplastics with a film of the gelatinous or bentonitic substances that gave the material its extraordinary plasticity. This method of manufacture also contributed greatly to the ease with which casting slips could be made and undoubtedly had much to do with the wide-spread acceptance of the material that today is used in many whiteware manufacturing plants on the Pacific Coast.

Furnaces Developed

Among the special pieces of equipment devised for carrying out the processes used in the production of the above products may be mentioned the so-called Curtis converter

which enables mullite to be manufactured at a total cost less than that previously expended for electrodes in the electric furnaces. The application of water at the boiling point to the mixing of refractory batches proved to be so beneficial that the former aging period of six weeks was completely eliminated and mud taken directly from the pans was made into difficult special shapes without a pound of clay of the ball-clay type being used in the body.

Many special electric furnaces were developed for the production of fused materials under controlled conditions of cooling to bring about desirable effects in crystallization and for the retardation of corundum and glass.

A technique in the operation of electric furnaces was devised to enable an untutored operator to determine when the K_2O fraction had been reduced to a desired figure by observation of the flame of the furnace through absorption filters, which practice has been continuously used for ten years with marked success.

Thermal Microscopy

In the laboratory technique, perhaps the most interesting is that of thermal microscopy which, through the medium of electrical stages, enables silicate reactions to be observed and photographically recorded through the microscope. The reverse of this technique, *i.e.*, using sub-zero temperatures, forms the major basis for the highly successful patent litigation of the Good Humor Ice Cream Corporation and the National Popsicle Company in demonstrating the nature of the bond formed when ice cream is frozen upon a wooden stick. The records of this litigation show, that thirty-one out of thirty-two adjudications in support of the patents have been obtained in the past five years.

Lectures

During the past fifteen years, Mr. Curtis has addressed the ceramic classes in some half dozen of the universities and most of the Local Sections of the American Ceramic Society. The Electrochemical Society, the American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, and the American Chemical Society have been adressed upon invitation in sections in nearly all parts of the country.

A partial list of publications follows:

Books and Articles by T. S. Curtis

(1) Everday Engineering Handbooks (series on development of a research engineer in popular mechanical magazines, 1913–1917).

(2) High-Frequency Apparatus. Norman W. Henley Co., N. Y. (1915, 1919, 1926).

(3) The Irreducible Volume. Vitrefrax Co. (1922).

(4) "Synthetic sillimanite in ceramic bodies," *Jour. Amer. Ceram. Soc.*, **8** [1] 63–68 (1925).

(5) "Refractories for oil-burning boilers," *Mech. Eng.*, **67** [4] 299 (1925); *Ceram. Abs.*, **4** [6] 167 (1925).

(6) "Vitrox: a new ceramic material to strengthen pot clays," *Nat. Glass Budget*, **42** [8] 19 (1926); *Ceram. Abs.*, **5** [9] 278 (1926).

(7) "Super-refractory manufacture," *Ceram. Ind.*, **7** [1] 47 (1926); *Ceram. Abs.*, **5** [11] 365 (1926).

(8) "Fire cone 28 mullite brick in tunnel kiln," *Ceram. Ind.*, **7** [5] 464–65 (1926); *Ceram. Abs.*, **6** [1] 24 (1927).

(9) "Photomicrography in natural color," *Jour. Amer. Ceram. Soc.*, **11** [8] 609–32 (1928).

(10) "Physical structure of refractory materials," *ibid.*, **11** [12] 904–16 (1928); translated in French Ceramic Society publication by R. V. Wideman, *Céramique*, **32** [492] 41–43 (1929); *Ceram. Abs.*, **9** [10] 850 (1930).

(11) "Mullite refractories in oil refining," *Chem. Met. Eng.*, **37** [9] 590 (1930); *Ceram. Abs.*, **9** [12] 1053 (1930).

(12) "Ceramic body from Mojave desert," *Chem. Met. Eng.*, **38** [11] 654 (1931); *Ceram. Abs.*, **11** [2] 120 (1932).

(13) "Evolution of mullite refractories" (including service records); paper presented at the Annual Meeting, American Ceramic Society, Toronto, Ont., 1930; *Ceram. Abs.*, **9** [3] 192 (1930).

(14) "Substitution of inert aggregates for quartz in ceramic bodies"; paper presented at Annual Meeting, American Ceramic Society, Toronto, Ont., 1930; *Ceram. Abs.*, **9** [3] 208 (1930).

(15) "An 'inside' story of ceramics"; paper presented at Annual Meeting, American Ceramic Society, Toronto, Ont., 1930; *Ceram. Abs.*, **9** [3] 236 (1930).

(16) "Motion picture as an aid to refractories research," *Bull. Amer. Ceram. Soc.*, **11** [5] 114–23 (1932).

(17) The evolution of mullite refractories (motion picture exhibited before the Local Sections of the American Ceramic Society at Los Angeles, Detroit, New Brunswick, Salt Lake City, Baltimore, and Seattle; before the American Chemical Society at Washington; presented as part of lecture which opened the Annual Meeting, American Ceramic Society at Toronto, 1930).

(18) "Effect of physical structure in refractories," *Fuels & Fur.*, **10** [4] 269–72 (1932); *Ceram. Abs.*, **11** [10] 529 (1932).

(19) "Physical structure of refractory materials," *Rev. belge ind. verrières, céram., émail.*, **3** [10] 223–24 (1932); *Ceram. Abs.*, **12** [10–11] 375 (1933).

(20) "Overglaze process developed with direct-color photography," *Ceram. Ind.*, **22** [2] 93 (1934); *Ceram. Abs.*, **13** [4] 78 (1934).

Patents Issued to T. S. Curtis

(1) Apparatus for firing brick, U.S. 1,562,441, Nov. 24, 1925; *Ceram. Abs.*, **5** [2] 55 (1926).

(2) Interlocking refractory brick, U.S. 1,606,150.

(3) Grinding ball and process of making, U.S. 1,640,885, Aug. 30, 1927; *Ceram. Abs.*, **6** [11] 537 (1927).

(4) Nonslip floor tile, U.S. 1,640,886, Aug. 30, 1927; *Ceram. Abs.*, **6** [11] 534 (1927).

(5) Heat treatment of alumina and other materials, U.S. 1,662,739, March 13, 1928; *Ceram. Abs.*, **7** [7] 419 (1928).

(6) Magnesia product and process of making, U.S. 1,690,771.

(7) Apparatus for heat treatment of materials, U.S. 1,696,794.

(8) Electric torch furnace, U.S. 1,747,756.
(9) Clay compound and method of making, U.S. 1,768-545.
(10) Apparatus for making ceramic articles, U.S. 1,703-871, March 5, 1929; *Ceram. Abs.*, **8** [5] 353 (1929); France 642,829.
(11) Making refractory composition, U.S. 1,715,449, June 4, 1929; *Ceram. Abs.*, **8** [8] 588 (1929).
(12) Making refractory composition, U.S. 1,741,920, Dec. 31, 1929; *Ceram. Abs.*, **9** [3] 203 (1930); Belgium 339,724; Brit. 289,560; France 630,037.
(13) Making clay compound, U.S. 1,768,545, July 1, 1930; *Ceram. Abs.*, **9** [9] 750 (1930).
(14) Forming ceramic articles, etc., U.S. 1,768,546; *Ceram. Abs.*, **9** [9] 803 (1930).
(15) Recrystallized refractory composition, U.S. 1,786,482.
(16) Clay product, ceramic composition, and associated processes, U.S. 1,803,999, May 5, 1931; *Ceram. Abs.*, **10** [7] 511 (1931).
(17) High-strength ceramic composition, U.S. 1,827,838, Oct. 20, 1931; *Ceram. Abs.*, **11** [1] 68 (1932).
(18) Composition for ceramic uses, U.S. 1,830,934, Nov. 10, 1931; *Ceram. Abs.*, **11** [1] 68 (1932).
(19) Making ceramic composition, U.S. 1,833,712, Nov. 24, 1931; *Ceram. Abs.*, **11** [2] 117 (1932).
(20) Process for making ceramic compositions, U.S. 1,834,515.
(21) Process of making fused amorphous ceramic composition, U.S. 1,973,408, Sept. 11, 1934; *Ceram. Abs.*, **14** [1] 26 (1935).
(22) Clay product, ceramic composition, and associated processes, Brit. 272,258; France 628,942.
(23) Process of forming ceramics, Brit. 291,523, July 25, 1928; *Ceram. Abs.*, **7** [10] 702 (1928); France 628,942.
(24) Ceramic product and process of making, Brit. 291-524, July 25, 1928; *Ceram. Abs.*, **7** [10] 703 (1928); France 642,830.
(25) Casting pottery, etc., Brit. 291,525, July 25, 1928; *Ceram. Abs.*, **7** [10] 703 (1928).
(26) Converter, U.S. 2,065,566, Dec. 29, 1936.

COMMUNICATIONS—CERAMIC HISTORY

ROBERT KENNEDY DUNCAN

EDITOR'S NOTE: Acknowledgment for this sketch of Dr. Duncan is given to W. A. Hamor, Assistant Director of Mellon Institute of Industrial Research. Dr. Hamor makes the following statement in connection with his "Impressions of Robert Kennedy Duncan":

"This brief sketch of the life and works of Robert Kennedy Duncan was contributed to The Dictionary of American Biography by invitation from the editor, Dr. Allen Johnson, with whose kind permission it is reprinted, modified, for distribution in Mellon Institute. The information on which this article is based was obtained from the archives of Mellon Institute and from biographic notes made by Miss Lois Whittle, Dr. Duncan's secretary, 1910–1914."

In 1848, John James Duncan, a young man of about 27, arrived in Canada from Ireland. Several years later his father, a school teacher, and mother, two brothers, and a sister joined him at Brantford, Ontario, where he had settled. Robert Augustus Kennedy Duncan, one of these brothers, who was born at Newtownards, County Down, Ireland, in 1837, married Susan Hawley (born, 1841, in Brant County, Ontario) near Brantford, and they had three children, Robert Kennedy (November 1, 1868–February 18, 1914); Norman (1871–1916), who also became a noted educator and author; and Ernest Hawley (1876–1929), who studied dentistry and practiced this profession in Fredonia, N. Y.

Robert Kennedy Duncan, the eldest son, became deeply interested in science in his preparatory-school days; later, when in attendance at the University of Toronto, he specialized in physics and chemistry. Following his graduation from Toronto in 1892, with the degree of B.A., he determined to pursue advanced study in chemistry, and secured a fellowship in Clark University where he remained a year.

He then sought a teaching post and was appointed instructor in physics and chemistry in the Auburn, N. Y., Academic High School. He found the duties of this position even more interesting than he had expected and spent two years at Auburn, resigning in 1895 to accept a better opportunity in Dr. Julius Sachs' Collegiate Institute, New York City.

Duncan took advantage of his location in New York to pursue supplemental graduate work in chemistry at Columbia University in 1897–1898; and when he joined the faculty of the Hill School, at Pottstown, Pa., in 1898, he was unusually well informed in the fundamentals of chemistry and closely allied sciences as well as in the secondary-school teaching of chemistry. But following his marriage to Charlotte M. Foster of Brantford on December 27, 1899, he gave serious thought to the advantages of a collegiate position, and, after studying abroad in 1901, applied for and was appointed to the professorship of chemistry in Washington and Jefferson College, Washington, Pa. He occupied this chair with distinction from 1901 to 1906, and continued his European studies during the summers of 1903, 1905, and 1906. He was as successful in teaching at Washington and Jefferson College as he had been in preparatory schools. He had the gift of imparting his keen enthusiasm to his students, and his pedagogic power soon became recognized by his associates on the faculty. Dr. Duncan also found time there to conduct scientific research on several industrial problems that were placed before him, and he devised new processes of manufacturing phosphorus and low-melting glass and also methods of decorating glass.

Writings on Chemistry

Duncan's preparatory-school experience and his general educational observations had made clear to him that there

existed a great need for writings on chemistry and other sciences that would acquaint the lay public with important discoveries through plain, easily understood translations of technical papers. He gave special attention to this useful literary work and, about 1900, became a contributor to several New York periodicals. In the summer of 1901, after his articles had attracted favor, he was sent abroad by *McClure's Magazine* to study radioactivity, particularly in the laboratory of Pierre and Marie Curie, in Paris. Two years later A. S. Barnes & Company assigned him to collect in Europe material that would be suitable for use in preparing the manuscript of a book on new scientific knowledge, and in 1905 and 1906 he made for *Harper's Magazine* a searching study of the relations of modern chemistry to industry in various European countries.

Literary Ability

Through this literary work Duncan became widely known to the public at large as an interpreter of science. He could impart life to the most abstruse scientific facts and make them of intense interest to laymen. He wrote with unique charm of style and remarkably clear explanatory power, and thereby, through his published articles and books, aroused a widespread realization of the importance and utility of science. His books, The New Knowledge (1905), The Chemistry of Commerce (1907), and Some Chemical Problems of Today (1911), were of the highest scientific accuracy, but were so composed as to hold the lay reader's sustained attention throughout their contents.

Industrial Application of Science

As a translator of scientific knowledge for the general public, he is ranked coördinate with John Tyndall, like whom it was "his to practice, as a part of the day's work, the humble and difficult art of singing the deeds of other men." All Duncan's later works teemed with his intense conviction that only through the application of modern science to industry will there ever come into the world an era of gracious living. The evidence that he presented satisfied many manufacturers of the usefulness of science in industry and led many students to perceive that the application of science to the material needs of men is just as much science and just as much research as that which is pursued solely for its own ends.

Through his Industrial Fellowship System in particular he promoted American science broadly and was the pioneer in directing industrial attention to the realizable functions of scientific research and in improving the conditions under which the scientist, and especially the chemist, works for industry.

Duncan enjoyed close and mutually helpful contact with his brother, Norman, throughout the most productive period of his literary career. Norman Duncan, a member of the staff of the *New York Evening Post* from 1897–1901, encouraged his brother to contribute scientific articles to this newspaper during 1900. He was also with Robert at W. & J. College, as professor of rhetoric, 1902–1906, and at the University of Kansas, as adjunct professor of English literature, 1907–1910.

Industrial Fellowship System

Robert Kennedy Duncan conceived the idea of his Industrial Fellowship System in 1906, while in attendance at the Sixth International Congress of Applied Chemistry in Rome. For some time previous to this Congress, he had been in Europe gathering literary material on chemistry. Through visits of inspection to factories, laboratories, and universities of some European countries, and through conversations with predominant industrialists and scientists, he had become impressed at various places with the spirit of coöperation that existed between technology and science which made for the advancement of both. At the same time, he became aware more than ever before of the fact that much of American chemical industry, from the standpoint of manufacturing efficiency, was in a weak condition. The absence of the appreciation of scientific research methods was one reason for this state of affairs, and Duncan was led to propose a remedy in a definite type of Industrial Fellowships. His plan was to assist manufacturers who desired to break away from traditional procedure and to make even more scientific that production already well on the road from tradition to science. He decided to dedicate his life to the application of his System.

With University of Pittsburgh in 1910

Upon his return from Europe to accept the chair of industrial chemistry in the University of Kansas, Duncan arranged for the establishment of the first Industrial Fellowship in January, 1907. By 1910, his effectual work at Kansas created a demand for his services in Pittsburgh, which, as a large industrial center, offered him special opportunities. He therefore accepted an invitation from Dr. Samuel Black McCormick, then chancellor of the University of Pittsburgh, to inaugurate his System in that institution in a department of industrial research, and the operation of the Fellowships was begun in a temporary building on March 1, 1911. Duncan served the University of Pittsburgh as professor of industrial chemistry as well as director of industrial research from 1910 until his death, on February 18, 1914. He was also director of industrial research at the University of Kansas, 1907–1912, and visiting lecturer at Clark University, 1911–1914.

Mellon Institute, March, 1913

Andrew W. Mellon and Richard B. Mellon, citizens of Pittsburgh and sons of Judge Thomas Mellon of the class of 1837 at the University of Pittsburgh, noted the practical success of Duncan's educational experiment and saw in his System an apparently sound method of benefiting American industry by studying manufacturing problems under suitable conditions and by training young men for technical service. In consequence of this interest, in March, 1913, they founded Mellon Institute of Industrial Research at the University of Pittsburgh, and later placed the Industrial Fellowship System on a permanent basis, as a memorial to their father (1813–1908) and also to Duncan. The first home of the Institute, located at Thackeray Avenue and O'Hara Street, was occupied in February, 1915, a year after Duncan's death, by the twenty-three Fellowships then in operation.

MELLON INSTITUTE OF INDUSTRIAL RESEARCH

The new building of the Mellon Institute of Industrial Research, Pittsburgh, which has been under construction for the past six years, was dedicated in honor of Andrew W. Mellon and Richard B. Mellon, the founders of the Institute.

The building is the gift to humanity of the late Richard B. Mellon and his brother Andrew W. Mellon, former Secretary of the United States Treasury, as was the case with the previous building, opened in 1915. The Mellon brothers established Mellon Institute in coöperation with the University of Pittsburgh and under the directorship of the late Robert Kennedy Duncan in 1911, and have given support to the Institute's research procedure and work from that time to the present. They have done so because they believed in the value of the idea of applying science practically for the benefit of mankind.

Richard B. Mellon, who died in 1932, realized that the older building had grown inadequate for its present-day work, despite the fact that when it was opened it was thought to have facilities for many more years. He favored the construction of the Institute's new home and took deep interest in its planning and erection. He saw the property acquired and construction begun, but he did not live to see the building completed and occupied. He urged the idea of clothing the structure in the architectural simplicity and dignity of ancient Grecian times.

Andrew W. Mellon, probably more widely known than his brother because of the years he spent in public life while Richard B. Mellon managed the affairs of the Mellon industrial and banking enterprises, has always taken keen interest in the work of the Institute and has encouraged it to engage more and more in the disinterested type of research work which strives for fundamental knowledge in the realm of the pure sciences, regarded as of basic importance to those applied researches which have helped industries to develop new products and processes. As a result, the new Institute home will have a department greatly expanded in pure sciences, such as chemistry, physics, and biology.

SYMBOLISM IN MELLON INSTITUTE

The new Mellon Institute was dedicated on May 5 to 9, 1937, with an impressive program of addresses by world-famous scientists.

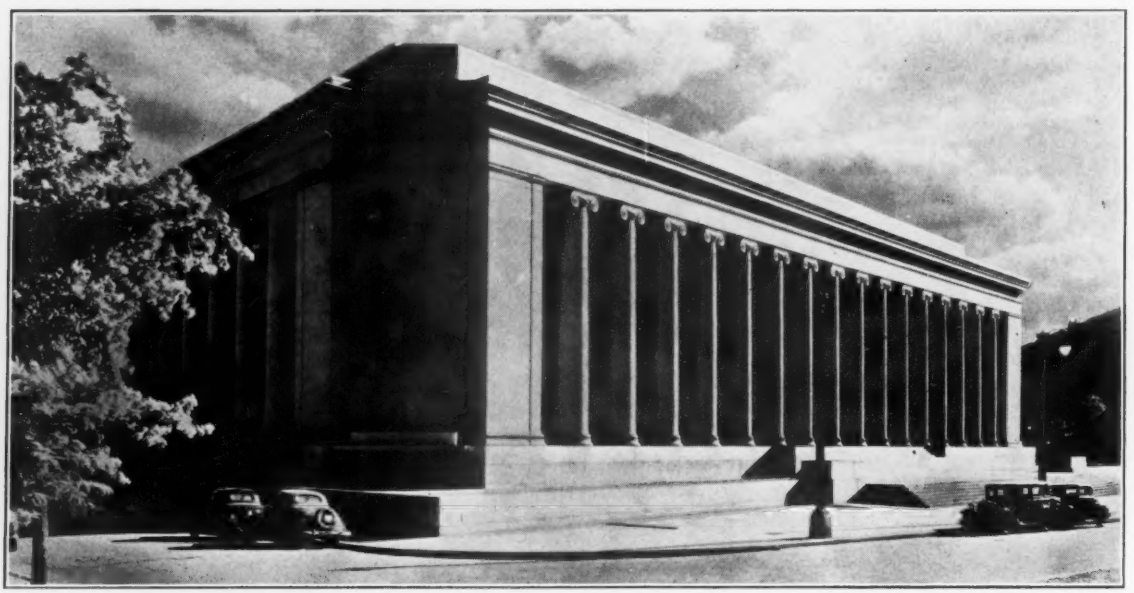
Dr. Weidlein, Director of Mellon Institute, has issued a foreword to a booklet which describes the new building in detail.

"Several parts of the new home of Mellon Institute have been invested with symbolic meaning to render the art therein emblematic of the purpose of the institution, the beneficence of science, the qualities of scientific research, the origin and advancement of chemistry, and the value of industrial research. This symbolism . . . . . was devised by Dr. Hamor, of the Institute's Executive Staff, in coöperation with Janssen & Cocken, the architects of the new building."

The Medallions—The Scope of Scientific Research

The medallions bearing (with permission) the emblems of American scientific and professional societies, representative of the principal fields of science and technology, constitute an important part of the symbolism of the building. These medallions, which signify the general character and breadth of the Institute's recognition of, indebtedness to, and collaboration with these organizations and their realms and also the scope of scientific research, both pure and industrial, particularly as conducted in the Institute, are here described.

The three medallions that are centrally located on the floor of the vestibule typify chemistry (American Chemical Society), chemical engineering (American Institute of Chemical Engineers), and physics (American Institute of Physics), the fields of research that are most prominent in



Mellon Institute of Industrial Research.

science, the industries, and the Institute. Chemistry and physics are closely related through physical chemistry. Chemistry includes biochemistry; physics, biophysics: and hence these basic biological and medical sciences are alluded to. Chemical engineering is essentially a combination of applied chemistry and applied physics.

The other ten medallions are placed in the aisle space separated from the main lobby by the columns, occupying center positions among these columns. Proceeding from the lobby to the left, the five medallions are as follows: science in general (American Association for the Advancement of Science); electrochemistry and electrometallurgy, suggesting applied chemistry (Electrochemical Society); mining engineering and metallurgy (American Institute of Mining and Metallurgical Engineers); ceramics, including glass technology (American Ceramic Society); and mechanical engineering, embracing physical technology (American Society of Mechanical Engineers). In this arrangement the dependence of engineering on science, of metallurgy on electrochemistry, of ceramics on mining engineering, and of mechanical engineering on ceramics and metallurgy are indicated. To the right of the lobby are the following five medallions: testing, both chemical and physical (American Society for Testing Materials); standardization (American Standards Association); sanitary science, public health, and industrial hygiene (American Public Health Association); pharmacy, pharmaceutical chemistry, pharmacology, and drug technology (American Pharmaceutical Association); and medicine (American Medical Association). The positions of these medallions are indicative of the relation of testing to standardization and of public health and pharmacy to medicine. The Institute does not carry on strictly medical or therapeutic research, but does sustain such investigational work elsewhere under the direction of physicians and does furnish, through its pharmaceutical and cognate research, materials for medical study. The Institute's coöperation with the medical profession is extensive and has been just as prolific as its collaboration with other professions.

NOTES AND NEWS

PORCELAIN ENAMEL INSTITUTE MEETING

With an official registration of 215 enamelers and students from all sections of the country, the Porcelain Enamel Institute Forum at the University of Illinois, May 5, 6, and 7, was a most successful project not only from the standpoint of a record attendance, but also because of a strictly "attend-to-business" attitude shown throughout sessions.

R. G. Calton, Tennessee Enamel Mfg. Co., Institute President, has proposed that an "internship" be created for ceramic students who desire to affiliate themselves with plants in the porcelain enameling industry.

"It might be well, if we are to have real coöperation between the industry and the colleges offering courses in ceramics, for us to provide some definite means whereby undergraduates can be placed in the industry before obtaining their degrees and go through a prescribed course of practical training which will better fit them for the future. I realize that in most cases the colleges require that one or two vacations be spent in the field, but I believe that possibly this could be enlarged upon and that the industry in coöperation with the universities could work out a course which would take the undergraduate through a particular plant of the type that he elects and which represents the particular field in which he proposes to work.

"This idea is suggested because I am fearful that a good many of the students who seek summer employment obtain laborers' jobs which are restricted in their nature and from which very little practical knowledge is gained. It is also possible that this idea might be enlarged upon and that the colleges might require that the year following graduation be in the nature of an internship and that graduates be required to render a proper account of this internship before obtaining their final degrees."

For complete program, see *Bull. Amer. Ceram. Soc.*, **16** [5] 227 (1937).

BATTELLE MEMORIAL INSTITUTE RESEARCH ASSOCIATES

Four appointments as Research Associate will be available at Battelle Memorial Institute, Columbus, Ohio, for the year 1937–1938. Appointments are for September to August, inclusive. These appointments are open to graduates of any accredited university or college. Preference will be given to men who have completed one or more years of graduate study in chemistry, physics, metallurgy, fuel technology, or ceramics or who have demonstrated marked aptitude for scientific research in their industrial experience.

The Research Associates will be members of a new division of the Institute which will supplement the regular technical staff. The purpose of the Research Associate Division is to extend the work of the Institute in fundamental science and at the same time to develop highly trained research men for industry.

Appointments as Research Associate will be for one year's duration, including vacation, and may be extended for a second year. The salary will be from $1200 to $1800 a year, depending upon the training and experience of the

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individual. Research Associates will be expected to devote their entire time to a research project approved by the Director and supervised by members of the Institute staff. Research projects will be of a fundamental or general character looking toward the publication of information that will be useful to science and industry.

Battelle Memorial Institute was established under the will of Gordon Battelle to contribute to industrial progress through scientific research. The activities of the Institute are carried on under nine main divisions: applied chemistry, industrial physics, process metallurgy, physical metallurgy, ceramics, refractories, fuel technology, ore dressing, and coal washing. Each division is equipped and staffed to carry on research under the direction of a specialist who is qualified by training and experience to direct original research in his field.

Application forms and further information may be secured by writing the Director, Battelle Memorial Institute, Columbus, Ohio.

CERAMIC COURSE AT UNIVERSITY OF TORONTO TO INCLUDE NONMETALLIC INDUSTRIAL MINERALS

The ceramic instruction at the University of Toronto, which was inaugurated in 1925 as a third and fourth year option, will be broadened in scope, beginning with the session 1937–1938.

The title will be "Ceramics and Nonmetallic Industrial Minerals." The subject matter will cover the ceramic, chemical, and industrial uses of nonmetallic minerals (excluding fuel). The new course will consist of four years' training within the Department of Metallurgical Engineering of the Faculty of Applied Science and Engineering and will lead to the degree of Bachelor of Applied Science.

The curriculum is designed to take care of the increased importance of nonmetallic industrial minerals, and it is recognized that ceramics is the most important branch of this broader field. Present-day processing of raw materials and technical control of the composition and properties of products make an emphasis on chemistry and physical chemistry desirable. In addition to the usual ceramic courses and a necessary number of general engineering subjects, economic geology, mineralogy, petrography, and the fundamentals of ore-dressing are included.

The industrial uses both of metals and nonmetals will be covered within this one Department. It is felt that the change will meet the present-day needs of the industry. Robert J. Montgomery will be in charge of the new course.

—Robert J. Montgomery,
Associate Professor of Ceramics

SUMMER SCHOOL OF CERAMICS

New York State College of Ceramics

Ceramic students and plant workers who are interested in doing summer study, either along the lines of advanced study or for the purpose of making up back work, are requested to write to the director of the Summer School at Alfred, N. Y.

Using the excellent equipment of the New York State College of Ceramics and employing many of their professors, this summer school is offering courses in glass, whiteware, petrography, X-ray, and enamels and also general ceramic technology.

Under the supervision of Charles Harder, the special courses in pottery production and ceramic design will again be offered. Craft courses in weaving, jewelry, metalworking, and industrial arts will be open to ceramic students.

The tuition is low and living costs reasonable.

SUMMER COURSE IN POTTERY AND CERAMIC ART

West Virginia University

Announcement is made of a course in Pottery and Ceramic Art being given in the Chemical Engineering Laboratory, West Virginia University, Morgantown, W. Va., from June 9 to July 21. A description of this course is presented, although the course will be in progress when this issue of *The Bulletin* is published. W. A. Koehler is in charge of this summer session. The course, No. 112s, may be taken for 2 or 4 hours credit. The 2-hour course will meet daily (except Saturdays) from 9:00 A.M. to 12:00 M. and will cover the fundamentals of clayworking, design, and decoration; preparation of clay, shaping of ware, firing, and decoration; discussion of theory involved, industrial practice, history of pottery, and decoration.

Those taking the work for 4 hours credit will take the morning classes and will also meet from 2:00 to 4:00 P.M. Additional work in design, types of glazes, coloring materials used in ceramics, decorative materials used in ceramics, and effect of firing will be studied.

Thomas Parker, a practical potter, who has had many years of industrial and teaching experience, will assist in the clay shop.

No special fee is charged for the course.

Credit from this course is applicable for Teacher's Certificate issuance or renewal to satisfy requirements for co-curricular or industrial art (shop) courses.

OHIO CERAMIC INDUSTRIES ASSOCIATION SPRING MEETINGS

Refractories Division, Oak Hill, Ohio

Friday, May 14

Presiding: O. E. Miller, Pyro Clay Products Co., Oak Hill, Ohio.

"Temperature Expansion Curves of Some Silica Brick Mixtures": by C. J. Koenig, Eng. Expt. Station, Ohio State Univ., Columbus, Ohio

"Development of Tests for Insulating Materials": by S. M. Phelps, Director of Research and Tests, Mellon Institute, Pittsburgh, Pa.

"Fitting the Motor to the Job": by Harold W. Bibber, Professor of Electrical Engineering, Ohio State Univ., Columbus, Ohio

"Grain Sizing": by G. A. Bole, Eng. Expt. Station, Ohio State Univ., Columbus, Ohio

Discussion of Social, Economic, and Legislative Condi-

tions Facing the Refractories Industry at the Present Time:

(1) Legislative Phase: by C. E. Bales, Ironton Fire Brick Co., Ironton, Ohio

(2) Social and Economic Phase: by D. D. Davis, Davis Fire Brick Co., Oak Hill, Ohio

The officers elected at this meeting were *Chairman*, J. M. McKinley, North American Refractories Co., Cleveland, Ohio; *Vice-Chairman*, E. E. Davis, Davis Fire Brick Co., Oak Hill, Ohio

Structural Clay Products Division, Findlay, Ohio

Monday, May 17

A plant visit was made to the Hancock Brick & Tile Co. where a demonstration was given of pre-drying the clay before pugging in rotary clay drier, unique de-airing equipment, and conveyers for unloading kilns.

Presiding: J. Leo Child, Hancock Brick & Tile Co., Findlay, Ohio

"Altering Properties of Clays for a Better Product": by G. A. Bole, O. S. U. Engineering Experiment Station, Columbus, Ohio

"A New Method of Studying Interior Defects": by J. O. Everhart, O. S. U. Engineering Experiment Station.

Discussions followed the presentation of the papers. The meeting was adjourned at 4:00 P.M.

The officers elected were *Chairman*, J. H. Stewart, Stark Ceramics Inc., Canton, Ohio; *Vice-Chairman*, W. H. Crangle, Cleveland Builder's Supply Co., Cleveland, Ohio.

Whiteware Division and Pittsburgh Section, American Ceramic Society, New Castle, Pa.

Tuesday, May 25

Presiding: R. W. Rowland, New Castle Refractories Co., New Castle, Pa.

"The Metal Tube-Type Decorating Kiln": by Philip Dressler, Swindell-Dressler Co., Pittsburgh, Pa.

"Photomicrotexture of Glazes": by J. H. Koenig, O. S. U. Engineering Experiment Station.

"Treatment of Filter Press Plates by Painting, Enameling, Metallizing, and Galvanizing": by D. M. Wilhelm, Patterson Foundry & Machine Co.

Following a golf tournament in the late afternoon, dinner was served at the New Castle Field Club. The after-dinner speaker was C. W. McKee, Head of the Department of Economics and Business Administration, Westminister College, New Wilmington, Pa. His subject was "Readjustments Required for Recovery."

The officers of this Division will be elected by letter ballot and will be announced later.

CLAY PRODUCT PLANT OPERATORS' CONFERENCE MAY 21 AND 22

University of Illinois

A conference for operators of plants and for those interested in the production problems in the manufacture of structural clay products and refractories was held at the Department of Ceramic Engineering at the University of Illinois at Urbana on May 21 and 22. The subjects presented and discussed in the conference were of immediate interest to the superintendent and the foreman who are concerned with the everyday problems in plant operation. The talks were in plant language by men who spoke from their own experience. There was opportunity for discussion and an exchange of ideas on the subjects presented. Those who attended were able to get a new idea or a new slant on some problem.

Frequently it is necessary to explore a clay deposit to determine future resources or to plan the best method of procedure in development of the clay pit. This was discussed in a paper on "Prospecting Clay Deposits by the Drilling Method."

Grinding and screening is an important feature in plant operation. Methods and results differ widely. Experience with different types of equipment in plant operations was given in a series of talks and operation data were presented.

The lamination problem is ever-present in the production of stiff-mud products. The results of studies on the effects of auger and die combinations brought new light on causes and means of correction. Corrective methods by die design presented another phase of the solution.

Inefficient use of power and unsatisfactory results in fan applications are frequently due to the use of the wrong type or size of fan. Important information on the selection and application of fans for clay-products plants was discussed.

Other subjects of equal interest and importance to the clay plant operator were presented in this two-day program. The conference afforded an opportunity not only to hear valuable papers and discussions on these important topics in plant operation but to exchange ideas and experiences with men who are dealing with the same problems.

The following program was presented at the Conference:

Friday, May 21

Address of Welcome

M. L. Enger, Dean, College of Engineering, University of Illinois

"Prospecting Clay Deposits by the Drilling Method": V. W. Boeker, Richards Brick Co., Edwardsville, Ill.

Grinding and Screening Symposium

"Dry-Pan Grinding": I. R. Cline, Western Brick Co., Danville, Ill.

"Hammer Pulverizer Grinding": D. P. Ogden, Streator Brick Co., Streator, Ill.

"Grinding with the American Pulverizer": H. R. McCune, Decatur Brick Co., Decatur, Ill.

"Data on Plant Screening Practice": R. K. Hursh, Dept. of Ceramic Engineering, Urbana, Ill.

"Dust Control in Clay Plants": John M. Kane, American Air Filter Co., Louisville, Ky.

8:00 P.M.

"Lighting": J. O. Kraehenbuehl, Dept. of Electrical Engineering, University of Illinois

Saturday, May 22

Lamination Symposium

"A Plant Study of Auger and Die Combinations": H. Z. Schofield, Research Director, National Paving Brick Assn., Columbus, Ohio

"Lamination and Corrective Methods by Die Design": Charles H. Henderson, Alton Brick Co., Alton, Ill.

Discussions

"Selection and Application of Fans for Clay Products Plants": R. R. Robinson, Robinson Ventilating Co., Zelienople, Pa.

"Developments in Car Tunnel Kilns": L. L. Ladd, Ladd-Cronin Engineering Co., Lockport, Ill.

REVISED SIMPLIFIED PRACTICE RECOMMENDATION R38, SAND-LIME BRICK

The Standing Committee in charge of Simplified Practice Recommendation R38, Sand-Lime Brick, has approved a revision of the recommendation, and the Division of Simplified Practice of the National Bureau of Standards has mailed copies to all interests for consideration and approval.

The original recommendation, which became effective July 1, 1925, provides for one standard size of sand-lime brick, 8 by $3^3/_4$ by $2^1/_4$ inches. The recommendation was reaffirmed without change in 1926, 1928, and 1933.

The current revision provides for the addition of a tolerance of $^1/_4$ inch on length, and $^1/_8$ inch on thickness and width, without any change in the standard size. The revised schedule, when adopted, will remain in effect until it is again revised by the Standing Committee of the industry.

CHICAGO DISTRICT ENAMELERS CLUB

Members of the Chicago District Enamelers Club held their Annual Banquet at the Chateau des Plaines, Chicago, Ill., on May 28. Following the dinner at 6:30, the enamelers enjoyed a program of variety entertainment. E. R. Brauner is President of this organization, F. R. Porter, Vice-President, and F. D. Hodek, Jr., Secretary.

NEW METHOD FOR BONDING PORCELAIN ENAMELED ARCHITECTURAL PANELS TO MASONRY

An announcement of importance to manufacturers engaged in production of porcelain enameled panels for architectural purposes, architects, builders, construction engineers, and chain operators is that of the new method known as "Pem-lox" by which metal panels are securely bonded to masonry or cement or by plastics. This development does not involve the sale of merchandise but is offered to industry by the Porcelain Enamel and Manufacturing Co., Baltimore, Md.

Pem-lox is a method of treating the reverse side of the metal panel to produce cup-shaped depressions of irregular size, which bonds perfectly with cement or plastics. It can be applied in any porcelain enameling shop with regular spraying equipment.

"TUNNEL OF LIGHT" COLOR-MATCHING BOOTH

To manufacturers of white porcelain products, there are as many degrees of whiteness as there are shades of blue. Many factors, difficult to control in the manufacture of porcelain, enter into the whiteness of the product making unavoidable variations in color. Unless all the panels used on a refrigerator or range are carefully matched, the difference in color is noticeable to the purchaser.

Many methods for inspection have been employed, but the "Tunnel of Light" recently installed in the Westinghouse Plant is the most effective to be used. This room has no corners, employs combination incandescent-mercury lighting with an effective intensity of 114-foot candles, and is shadowless so that even curved surfaces may be compared effectively against standard colors. This color-matching booth has been termed one of the most efficient lighting systems for color matching in the world.

Before the installation of the "Tunnel of Light," rejects were at least 300% higher; during the peak months of 1936, color rejects found on the assembly floor were less than 1%.

The room is designed to eliminate shadows and to provide a high intensity of diffused even lighting. If a pencil were placed anywhere in the room, there would be no visible shadow cast from it. The inspectors wear only white uniforms. Thus every precaution against optical illusions is provided in this modern inspection booth.

On flatware, the pieces are checked on the color matcher. All panels with large radii, however, are checked with the color standards. A man checks the enamel for thickness on an electro-magnetic gage. The inspectors are required to report periodically to an eye specialist for eye tests. On range parts, any enamel that is more than 0.018 inch thick is scrapped, inasmuch as thicker enamel would chip readily, not only in the assembly, but in transportation and after it had been installed.

AMERICAN DOCUMENTATION INSTITUTE

An "American Documentation Institute" has been incorporated on behalf of various scientific and other learned societies for the purpose of developing and operating facilities for the distribution of information. The first objective of the new organization will be to develop and apply the new technique of photomicrography to library, scholarly, scientific, and other material. Organized as a Delaware corporation "for educational, literary, and scientific purposes," the new organization resulted from a meeting attended by delegates from national councils, societies, and other organizations in Washington on March 13, 1937. The board of trustees elected consists of Robert C. Binkley, Western Reserve University; Solon J. Buck, Director of Publications, National Archives; Watson Davis, Director, Science Service; James Thayer Gerould, Librarian, Princeton University Library; Ludvig Hektoen, Chairman, National Research Council.

The national organization is an outcome of the documentation activities of Science Service begun in July, 1935, which have consisted of a "Bibliofilm Service."

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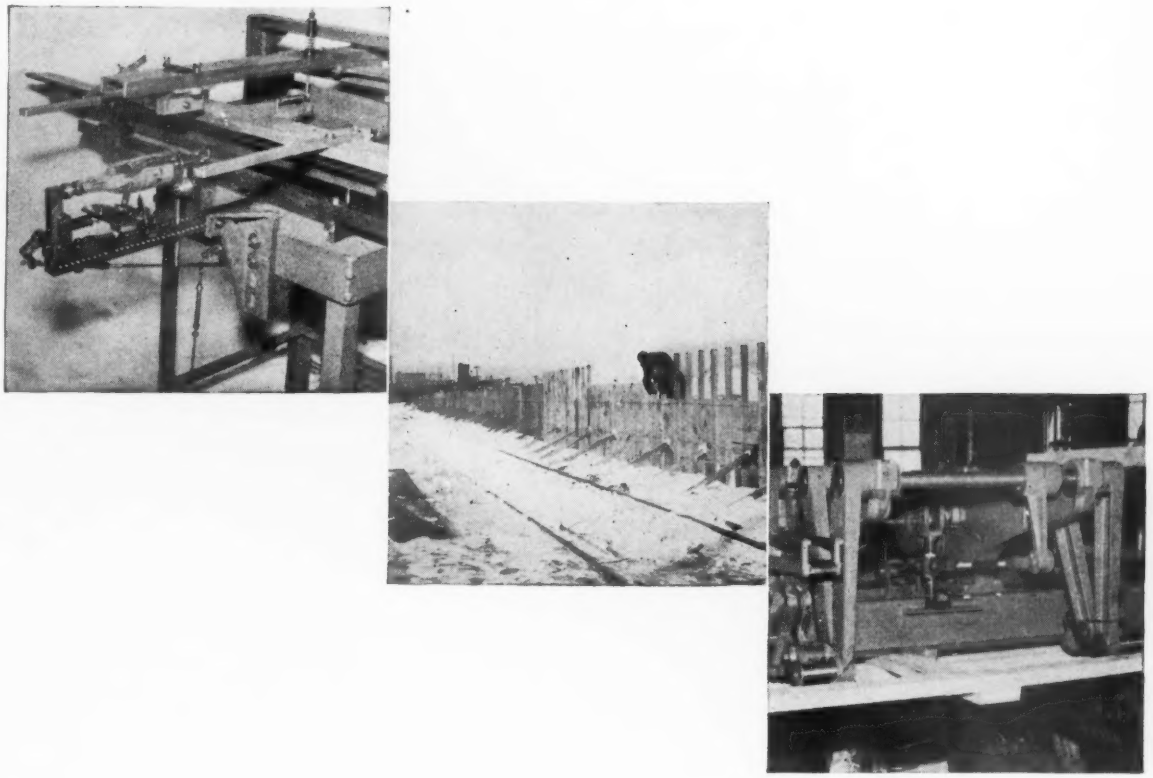

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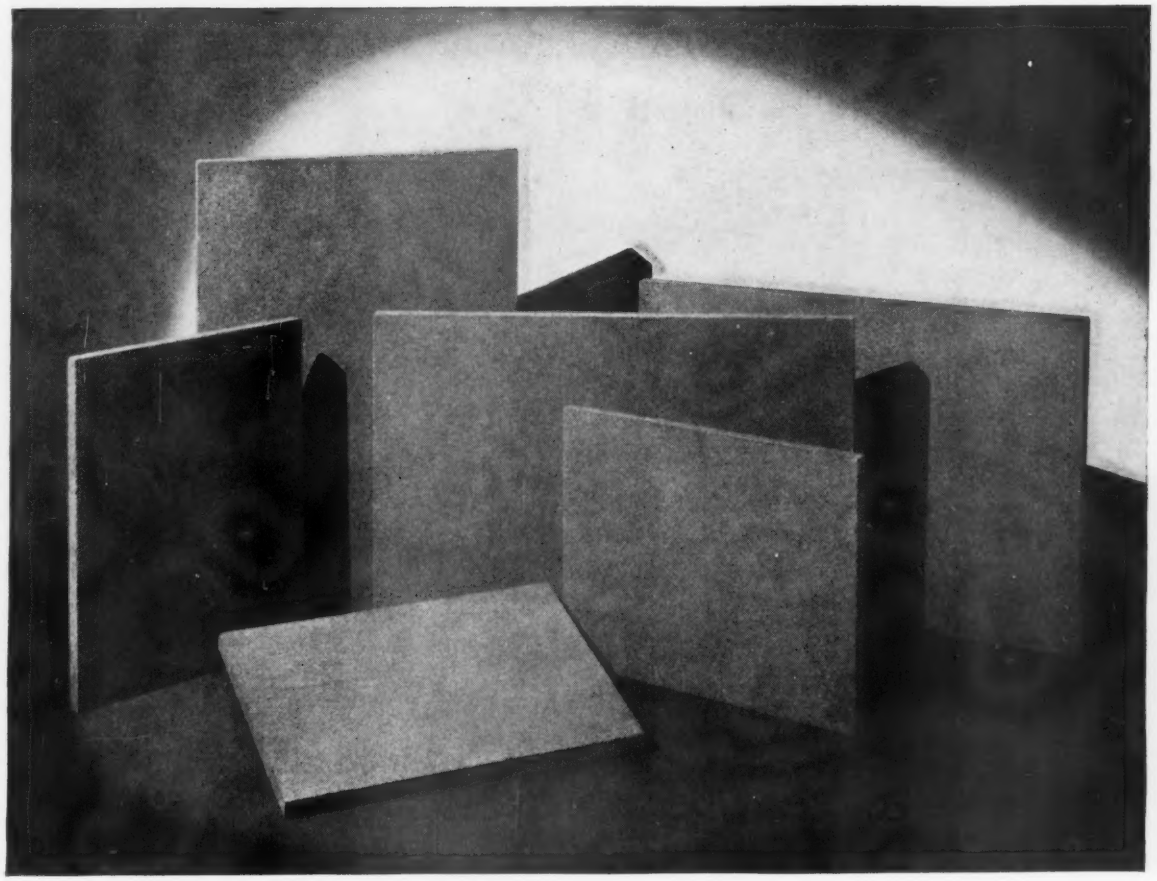

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KILN loads must be properly set and the kiln furniture must have reliable qualities; batts and supports must be strong; they must occupy as little kiln space as possible and must give long life.

Crystolon Kiln Furniture meets these exacting requirements—made of Crystolon, the Norton silicon carbide—it will resist deformation under load at kiln temperatures. The record of Crystolon Batts, Saggers, Setter Tile, Supports and Car Tops assures a saving in kiln firing costs.

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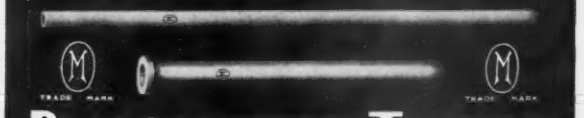
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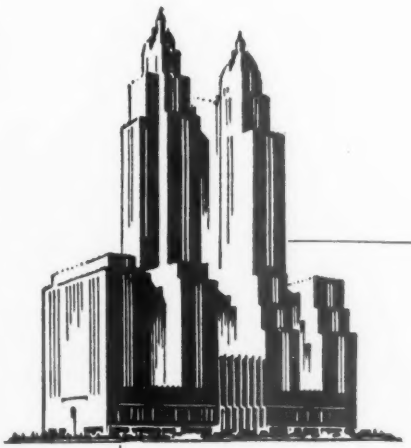

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In the Cabildo in 1803, the transfer of Louisiana from Spain to France and from France to the United States took place. The Cabildo was the form of government of New Orleans which succeeded the French rule of the Superior Council. It had ten members besides the governor and a secretary, six buying their seats for life and four elected yearly.

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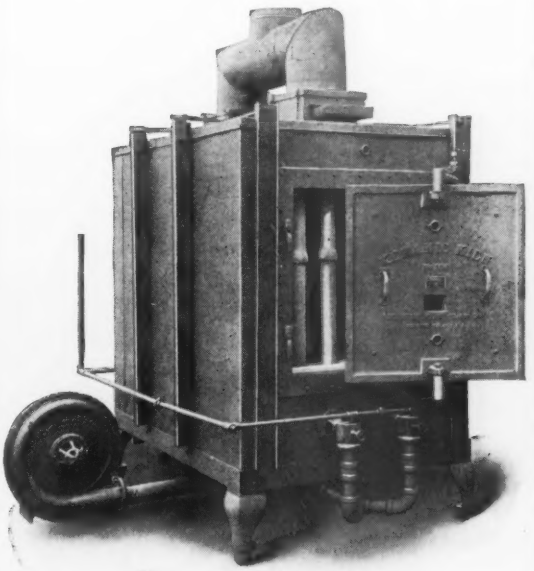

Kiln No. 106 (illustrated) is 31″x 48″x 36″ inside dimensions. Can be equipped either with gas or kerosene natural draft burners or with force draft fuel oil burners.

Because of their rapid operation, high efficiency, and ease of control, KERAMIC KILNS are popular for commercial production as well as development work.

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Bulletin 360

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June 1, 1937

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As I watched that real horse, War Admiral, win the Derby I could not help but think how hard it is to beat that rare combination of real quality well managed.

The son of two of this country's greatest horses, trained by a master and ridden by Charley, that little giant, just couldn't be beaten.

The Spinks Clay Company searched the hills of Tennessee for many years before it was decided that CHAMPION & CHALLENGER are the best BALL CLAYS, and the best men obtainable have always been employed to manage and guard their uniformity and quality.

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Vol. 16, No. 6, pp. 231-70 (1937)